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THE CANADIAN PHYTOPATHOLOGICAL SOCIETY /

CANADIAN PLANT DISEASE SURVEY

- DISEASE HIGHLIGHTS

SOCIÉTÉ CANADIENNE DE PHYTOPATHOLOGIE / INVENTAIRE DES MALADIES DES PLANTES AU CANADA - APERÇU DES MALADIES

The Society recognizes the continuing need for publication of plant disease surveys which benefit both federal and provincial agencies in planning appropriate research for the control of plant diseases. The reports you contribute are important to document plant pathology in Canada.

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(+ earlier years for historical significance)

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Authors who have traditionally published scientific notes in the *Canadian Plant Disease Survey* are encouraged to submit this material to the scientific journal of their choice, such as the *Canadian Journal of Plant Pathology* and *Phytoprotection.*

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Diagnostic Laboratories / Laboratoires diagnostiques

CROP: Commercial crops - Diagnostic Laboratory Report
LOCATION: British Columbia

NAME AND AGENCY:
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Plant Diagnostic Pathologist, BC Ministry of Agriculture Food and Fisheries, Abbotsford Agriculture Centre, 1767 Angus Campbell Road, Abbotsford, BC V3G 2M3

TITLE: **DISEASES DIAGNOSED ON COMMERCIAL CROPS SUBMITTED TO THE BCMAFF PLANT DIAGNOSTIC LABORATORY IN 2001**

METHODS: The BCMAFF Plant Diagnostic Laboratory provides diagnosis and control recommendations for diseases and disorders of commercial agricultural crops grown in British Columbia. The following data reflect samples submitted to the laboratory by the ministry extension staff, growers, agribusinesses, parks boards, and Master Gardeners. Diagnoses were accomplished by microscopic examination, culturing onto artificial media, biochemical identification of bacteria using BIOLOG®, serological testing of viruses and bacteria with micro-well and membrane-based enzyme- linked immunosorbent assay (ELISA), electron microscope identification of virus particles and virus inclusion body technique. Some specimens were referred to other laboratories for identification or confirmation of the diagnosis.

RESULTS AND COMMENTS: Summaries of the diseases and their causal agents diagnosed on commercial crops are presented in Tables 1-9 by crop category. The total number of submissions for each crop category is listed at the bottom of each table. Problems not listed include: abiotic problems such as nutritional stress, pH imbalance, water stress, poor sample, physiological response to growing conditions, environmental and chemical damage, insect-related injury, and damage where no conclusive causal factor was identified.

Table 1. Summary of diseases diagnosed on **field crop** samples submitted to the BCMAFF Plant Diagnostic Laboratory in 2001.

CROP	DISEASE	CAUSAL ORGANISM	NO.
Orchardgrass	Root rot	*Pythium* sp.	1
	Virus	Undetermined	1
Rye grass	Rust	*Puccinia* sp.	1
TOTAL DISEASED SAMPLES			3
TOTAL SUBMISSIONS			5

Table 2. Summary of diseases diagnosed on **greenhouse floriculture** samples submitted to the BCMAFF Plant Diagnostic Laboratory in 2001.

CROP	DISEASE	CAUSAL ORGANISM	NO.
Antirrhinum majus	Leaf spot	*Pseudomonas syringae*	1
	Root rot	*Thielaviopsis basicola*	1
Antirrhinum sp.	Root rot	Oomycete	1
Begonia sp.	Impatiens necrotic spot	Impatiens necrotic spot (INSV)	1
Erica sp.	Root rot	Oomycete	1
	Root rot	Oomycete	1
Euphorbia pulcherrima	Pythium root rot	*Pythium* sp.	1
	Root rot	Oomycete	1
	Root rot	Oomycete	1
	Soft rot	*Erwinia carotovora* subsp. *carotovora*	1
	Stem rot	*Botrytis cinerea*	1
Gerbera sp.	Crown and root rot	*Phytophthora* sp.	1
Gloxinia sp.	INSV	INSV	1
Hedera sp.	Stem and root rot	*Ascochyta* sp.	1
	Stem and root rot	Oomycete	1
	Stem and root rot	*Rhizoctonia* sp.	1
Hedera helix	Bacterial leaf spot	*Xanthomonas* sp.	1
Helianthus annuus	White smut	*Entyloma polysporum*	1
Heuchera sp.	Rust	*Puccinia heucherae*	1
Hoya sp.	Impatiens necrotic spot	Impatiens necrotic spot virus (INSV)	1
Hypericum sp.	Rust	*Uromyces hyperici*	1
Impatiens sp.	INSV	INSV	1
	Root rot	*Pythium* sp.	1
Iris sp.	Rust	*Puccinia iridis*	1
Kalanchoe sp.	INSV	INSV	1
Lavandula sp.	Leaf spot	*Pseudomonas syringae*	1
Lupinus sp.	Leaf and stem spot	*Colletotrichum* sp.	1
	Root rot	Oomycete	1
Narcissus sp.	Botrytis blight	*Botrytis* sp.	1
	Bulb and stem nematode	*Ditylenchus* sp.	1
Passiflora sp.	Stem canker	*Nectria* sp.	1
Pelargonium sp.	Botrytis canker	*Botrytis* sp.	1
Phlox sp.	Downy mildew	*Peronospora* sp.	1
Primula sp.	Botrytis canker	*Botrytis* sp.	1
	Root rot	Oomycete	1
Rudbeckia sp.	Leaf and stem spot	*Pseudomonas cichorii*	1
Saintpaulia sp.	Crown and root rot	Oomycete	1
Schlumbergera truncata	Fusarium stem rot	*Fusarium* sp.	1
	Root rot	Oomycete	1
Verbena sp.	Bacterial leaf spot	*Pseudomonas marginalis*	1
	Black root rot	*Thielaviopsis basicola*	1
Viola sp.	Leaf spot	*Pseudomonas cichorii*	1
Zinnia sp.	Botrytis canker	*Botrytis* sp.	1
TOTAL DISEASED SAMPLES			43
TOTAL SUBMISSIONS			79

Table 3. Summary of diseases diagnosed on **greenhouse vegetable** samples submitted to the BCMAFF Plant Diagnostic Laboratory in 2001.

CROP	DISEASE	CAUSAL ORGANISM	NO.
Cucumber	Crown and root rot	*Pythium* sp.	1
	Fusarium root & stem rot	*Fusarium oxysporum* f.sp. *radicis-cucumerinum*	1
	Pythium root rot	*Pythium* sp.	1
Lettuce	Downy mildew	*Bremia lactucae*	1
	Stem rot	*Botrytis* sp.	1
Melon	Powdery mildew	*Erysiphe cichoracearum*	1
Pepper	INSV	INSV	1
	Stem rot	*Penicillium* sp.	1
Tomato	Fusarium crown/root rot	*Fusarium oxysporum* f.sp. *radicis-lycopersici*	1
	Leaf mould	*Fulvia fulva*	1
	Leaf spot	*Pseudomonas syringae*	1
TOTAL DISEASED SAMPLES			11
TOTAL SUBMISSIONS			24

Table 4. Summary of diseases diagnosed on **perennial herbaceous ornamental** samples submitted to the BCMAFF Plant Diagnostic Laboratory in 2001.

CROP	DISEASE	CAUSAL ORGANISM	NO.
Armeria sp.	Anthracnose	*Colletotrichum* sp.	1
	Crown rot	*Rhizoctonia solani*	1
Astilbe sp.	Root rot	*Rhizoctonia* sp.	1
Bergenia sp.	Foliar nematode	*Aphelenchoides* sp.	2
Campanula sp.	Rust	*Coleosporium campanulae*	1
Clematis sp.	Damping off	*Rhizoctonia solani*	1
Convallaria sp.	Botrytis blight	*Botrytis* sp.	1
Erysimum sp.	Root rot	Oomycete	1
Festuca sp.	Rust	*Puccinia* sp.	1
Geranium sp.	Crown and root rot	Oomycete	1
	Downy mildew	*Plasmopara* sp.	1
Hedera sp.	Root rot	Oomycete	1
Helleborus sp.	Black leaf spot	*Coniothyrium hellebori*	1
Hemerocallis sp.	Foliar nematode	*Aphelenchoides* sp.	1
Hesperis sp.	Root rot	*Thielaviopsis basicola*/*Pythium* sp.	1
Iberis sp.	Pythium root rot	*Pythium* sp.	1
Lavandula angustifolia	Bacterial leaf spot	*Pseudomonas syringae*	1
Lonicera sp.	Pythium root rot	*Pythium cylindrosporum*	1
Nymphaea sp.	Leaf spot	*Cercospora* sp.	1
	Leaf spot	*Gloeosporium* sp.	1
Omphalodes sp.	Leaf blight	*Botrytis* sp.	1
	Leaf blight	*Phoma* sp.	1
Papaver sp.	Downy mildew	*Peronospora arborescens*	1
	Downy mildew	*Peronospora* sp.	1
Paxistima sp.	Root rot	Oomycete	1
Potentilla sp.	Rust	*Phragmidium* sp.	1
Primula sp.	Leaf mottling	Arabis Mosaic Virus	1
	Leaf mottling	Cucumber Mosaic Virus	1
Sedum sp.	Root rot	*Rhizoctonia* sp.	1
Stipa tenuissima	Pythium root rot	*Pythium volutum*	1
TOTAL DISEASED SAMPLES			31
TOTAL SUBMISSIONS			64

Table 5. Summary of diseases diagnosed on **small fruit and nut** samples submitted to the BCMAFF Plant Diagnostic Laboratory in 2001.

CROP	DISEASE	CAUSAL ORGANISM	NO.
Blackberry	Bacterial blight	*Pseudomonas syringae*	1
	Downy mildew	*Peronospora sparsa*	3
Blueberry	Bacterial blight	*Pseudomonas* sp.	1
	Bacterial blight	*Pseudomonas syringae*	8
	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	1
	Blueberry scorch	Blueberry Scorch Virus*	32
	Blueberry shock	Blueberry Shock Virus	4
	Crown and root rot	*Phytophthora* sp.	1
	Godronia canker	*Godronia cassandrae*	6
	Mummy berry	*Monilinia vaccinii-corymbosi*	1
	Root rot	*Phytophthora* sp.	2
	Root rot	Oomycete	2
	Tip dieback	*Botrytis cinerea*	1
Cranberry	Root rot	Oomycete, *Rhizoctonia* sp.	1
	Upright dieback	*Phomopsis* sp.	2
Currant (red)	Botrytis fruit rot	*Botrytis cinerea*	1
Raspberry	Phytophthora root rot	*Phytophthora fragariae*	8
	Phytophthora root rot	*Phytophthora* sp.	4
	Spur blight	*Didymella applanata*	2
Strawberry	Crown and root rot	*Phytophthora* sp.	3
	Powdery mildew	*Sphaerotheca macularis*	2
TOTAL DISEASED SAMPLES			86
TOTAL SUBMISSIONS			168

* An extensive Blueberry Scorch Virus survey was conducted in highbush blueberries in B.C. in 2001. The pattern of spread of the virus was studied in fields previously confirmed infected with this virus. Also studied was the symptomology on different varieties. A detailed report on the survey is available from Ms. Leslie MacDonald, BCMAFF, 1767 Angus Campbell Road, Abbotsford, BC. V3G 2M3

Table 6. Summary of diseases diagnosed on **special crop** samples submitted to the BCMAFF Plant Diagnostic Laboratory in 2001.

CROP	DISEASE	CAUSAL ORGANISM	NO.
Basil	Stem rot	*Fusarium* sp.	2
Ginseng	Damping off	*Rhizoctonia solani*	1
Wasabi	Leaf spot	*Phoma* sp.	1
TOTAL DISEASED SAMPLES			4
TOTAL SUBMISSIONS			7

Table 7. Summary of diseases diagnosed on **tree fruit and grape** samples submitted to the BCMAFF Plant Diagnostic Laboratory in 2001.

CROP	DISEASE	CAUSAL ORGANISM	NO.
Apple	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	2
	European canker	*Nectria galligena*	2
	Canker	*Phomopsis* sp.	1
Pear	Bacterial canker	*Pseudomonas syringae*	1
TOTAL DISEASED SAMPLES			6
TOTAL SUBMISSIONS			16

Table 8. Summary of diseases diagnosed on **turfgrass green, lawn, sod and tee** samples submitted to the BCMAFF Plant Diagnostic Laboratory in 2001.

CROP	DISEASE	CAUSAL ORGANISM	NO.
Green	Algae	Algae	1
	Anthracnose	*Colletotrichum graminicola*	5
	Curvularia blight	*Curvularia* sp.	1
	Dollar spot	*Sclerotinia homoeocarpa*	1
	Downy mildew	*Sclerophthora* sp.	8
	Fusarium patch	*Microdochium nivale*	6
	Leaf spot	*Leptosphaerulina* sp.	2
	Pythium	*Pythium* sp.	10
	Pythium root rot	*Pythium volutum*	1
	Sheath spot	*Rhizoctonia zeae*	2
	Take-all patch	*Gaeumannomyces graminis*	1
	Take-all patch	*Gaeumannomyces graminis* var. *avenae*	1
	Thinning	*Rhizoctonia* sp.	1
	Yellow patch	*Rhizoctonia cerealis*	4
Lawn	Anthracnose	*Colletotrichum graminicola*	2
	Leptosphaerulina leaf spot	*Leptosphaerulina* sp.	1
	Pink snow mould	*Microdochium nivale*	1
Sod	Anthracnose	*Colletotrichum graminicola*	3
	Ascochyta leaf blight	*Ascochyta* sp.	2
	Fusarium patch	*Microdochium nivale*	1
	Leptosphaerulina leaf spot	*Leptosphaerulina* sp.	1
	Melting out	*Drechslera poae*	1
	Pythium root rot	*Pythium* sp.	1
Sports Field	Fusarium patch	*Microdochium nivale*	1
	Red thread	*Laetisaria fuciformis*	2
Tee	Anthracnose	*Colletotrichum graminicola*	1
	Leptosphaerulina leaf spot	*Leptosphaerulina* sp.	2
	Root rot	*Pythium* sp.	1
TOTAL DISEASED SAMPLES			64
TOTAL SUBMISSIONS			91

Table 9. Summary of diseases diagnosed on **field vegetable** samples submitted to the BCMAFF Plant Diagnostic Laboratory in 2001.

CROP	DISEASE	CAUSAL ORGANISM	NO.
Artichoke	Bract spot	*Pseudomonas viridiflava*	2
	Leaf spot	*Alternaria/Ascochyta* sp.	1
Bean	Root rot	*Thielaviopsis basicola*	1
	Soft rot	*Pseudomonas fluorescens*	1
Beet	Dry rot	*Rhizoctonia* sp.	1
Celery	Late blight	*Septoria apiicola*	1
Garlic	Basal rot	*Fusarium* sp.	1
	Pink root	*Phoma terrestris*	1
	White rot	*Sclerotium cepivorum*	4
Lettuce	Anthracnose	*Microdochium panattonianum*	1
	Grey mould	*Botrytis cinerea*	1
	Pythium root rot	*Pythium* sp.	1
Onion	Leaf blight	*Stemphylium* sp.	1
Pepper	Root rot	Oomycete	1
	Root rot	*Thielaviopsis basicola*	1
Potato	Black scurf	*Rhizoctonia solani*	1
	Common scab	*Streptomyces scabies*	1
	Dry rot	*Fusarium* sp.	2
	Late blight	*Phytophthora infestans*	1
	Pink root	*Phytophthora erythroseptica*	2
	Leak	*Pythium* sp.	2
	Rhizoctonia canker	*Rhizoctonia solani*	1
	Soft rot	*Erwinia carotovora* subsp. *carotovora*	1
	Verticillium wilt	*Verticillium dahliae*	1
Rhubarb	Red leaf	*Erwinia rhapontici*	1
Sui choy	Soft rot	*Erwinia carotovora* subsp. *carotovora*	1
Tomato	Bacterial speck	*Pseudomonas syringae*	3
	Fruit rot	*Rhizoctonia solani*	1
Tomato*	Late blight	*Phytophthora infestans*	1
Zucchini	Soft rot	*Erwinia carotovora* subsp. *carotovora*	1
TOTAL DISEASED SAMPLES			39
TOTAL SUBMISSIONS			55

* The variety 'Legend', claimed to be resistant to late blight, was infected with *Phytophthora infestans*.

Table 10. Summary of diseases diagnosed on **woody ornamental** samples submitted to the BCMAFF Plant Diagnostic Laboratory.

CROP	DISEASE	CAUSAL ORGANISM	NO.
Abies grandis	Rust	*Uredinopsis* sp.	1
	Stem canker	*Phomopsis* sp.	1
Acer sp.	Canker	*Phoma* sp., *Cytospora* sp.	1
	Canker	*Phomopsis* sp.	1
Acer palmatum	Verticillium wilt	*Verticillium dahliae*	1
Acer rubrum	Powdery mildew	*Uncinula* sp.	1
Arbutus sp.	Black root rot	*Thielaviopsis basicola*	1
	Root rot	Oomycete	1
	Root rot	*Rhizoctonia* sp.	1
Azalea sp.	Crown and root rot	Oomycete	1
Buxus sp.	Root rot	Oomycete	1
Castanea sp.	Root rot	Oomycete	1
Cedrus sp.	Twig blight	*Sirococcus* sp.	1
Cornus sp.	Anthracnose	*Discula destructiva*	1
Cotoneaster sp.	Fire blight	*Erwinia amylovora*	1
Daphne sp.	Marssonina leaf blight	*Marssonina* sp.	1
	Root rot	Oomycete	1
Gaultheria 'Shallon'	Anthracnose	*Glomerella* sp.	1
Hebe sp.	Downy mildew	*Peronospora* sp.	1
Juniperus sp.	Dieback	*Lophodermium* sp.	2
	Root rot	*Phytophthora* sp.	2
Magnolia sp.	Canker	*Phomopsis* sp.	1
Malus sp.	European canker	*Cylindrocarpon* sp.	1
	Fire blight	*Erwinia amylovora*	1
	European canker	*Cylindrocarpon heteronema*	1
Oemleria cerasiformis	Ascochyta leaf spot	*Ascochyta* sp.	1
Paeonia sp.	Botrytis blight	*Botrytis paeoniae*	1
Picea abies	Needle blight	*Phomopsis* sp.	1
Picea glauca	Root rot	*Rhizoctonia* sp.	1
Picea pungens	Twig blight	*Phomopsis* sp.	1
Picea sitchensis	Black root rot	*Thielaviopsis basicola*	1
	Root rot	Oomycete	1
Picea sp.	Needle cast	*Rhizosphaera* sp.	1
Pinus ponderosa	Needle cast	*Elytroderma deformans*	1
	Needle cast	*Lophodermella concolor*	1
	Needle blight	*Hendersonia pinicola*	1
Populus sp.	Marssonina leaf blight	*Marssonina brunnea* f.sp. *trepidae*	1
Prunus sp.	Bacterial canker	*Pseudomonas syringae* pv. *syringae*	3
Prunus maziard	Crown and root rot	Oomycete	1
	Canker	*Botryosphaeria* sp.	1
Prunus virginiana	Cherry leaf spot	*Cylindrosporium* padi	1
Pseudotsuga menziesii	Root rot	*Phytophthora* sp.	1
	Swiss needle cast	*Phaeocryptopus gaeumannii*	1
	Botrytis blight	*Botrytis cinerea*	1
	Phomopsis canker	*Phomopsis* sp.	1
	Needle blight	*Rhizosphaera* sp.	1

Quercus sp.	Twig canker	*Cytospora, Phoma* and *Sphaeropsis* spp.	1
Rhododendron sp.	Botrytis canker	*Botrytis* sp.	1
	Crown rot	Oomycete	1
	Leaf spot	*Pestalotiopsis* sp.	1
	Phytophthora root rot	*Phytophthora* sp.	3
	Powdery mildew	*Microsphaera* sp.	1
	Rust	*Chrysomyxa* sp.	2
Rhododendron	Root rot	Oomycete	1
Ribes sp.	Root rot	Oomycete	1
	Root rot	*Thielaviopsis basicola*	1
Rosa sp.	Black spot	*Marssonina* sp.	1
	Downy mildew	*Peronospora sparsa*	2
	Rust	*Phragmidium tuberculatum* ?	1
Salix sp.	Twig canker	*Glomerella cingulata* & *Phoma* sp.	1
	Willow scab	*Venturia* sp.	1
Syringa sp.	Foliar blight	*Ascochyta syringae*	1
	Powdery mildew	*Microsphaera* sp.	1
	Root rot	Oomycete	1
Taxus sp.	Stem canker	*Fusarium* sp.	1
Thuja occidentalis	Charcoal rot	*Macrophomina phaseolina?*	1
	Root rot	*Phytophthora* sp.	2
	Root rot	Oomycete	1
Thuja plicata	Root rot	Oomycete	1
TOTAL DISEASED SAMPLES			78
TOTAL SUBMISSIONS			192

CROP: Commercial crops -- Diagnostic Laboratory Report
LOCATION: Saskatchewan

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TITLE: **DISEASES DIAGNOSED ON CROP SAMPLES SUBMITTED TO THE SASKATCHEWAN AGRICULTURE AND FOOD CROP PROTECTION LABORATORY in 2001**

METHODS: Saskatchewan Agriculture and Food's (SAF) Crop Protection Laboratory provides diagnostic services and recommendations for crop health problems to the agricultural industry. Services include disease, insect, and weed identification, and testing of weeds for herbicide resistance. In addition, the SAF Crop Protection Laboratory provides a Dutch elm disease program to the general public, under which American elms are screened for Dutch elm disease. Samples are submitted to the Crop Protection Laboratory by SAF extension agrologists, growers, agribusiness and home gardeners. Disease diagnosis is accomplished by microscopic examination, culturing on artificial media, ELISA testing and BIOLOG™.

RESULTS: Between April 1 and November 12, 2001 the Crop Protection Laboratory received 1142 samples of which 70% were for disease diagnosis (53% of these were American elms submitted for Dutch elm disease testing). Categories of highest to lowest volume, (excluding the Dutch elm disease samples) are: special crops (44%), cereals (28%), oilseeds (9%), fruit (4%), forages (2%) and vegetables (2%). Woody ornamentals, herbaceous ornamentals, turf, and greenhouse crops comprised the remaining 10% of the samples. Summaries of diseases/causal agents diagnosed on crop samples submitted to the Crop Protection Laboratory in 2001 are presented in Tables 1-8 by crop category. Samples submitted under the Dutch elm disease program totaled 417 American elms. Results of the Dutch elm disease program are presented in Table 9.

Table 1. Summary of plant diseases diagnosed on **cereal crops** submitted to the SAF Crop Protection Laboratory in 2001.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Barley	Fusarium head blight/*Fusarium* spp.	8
	Common root rot/seedling blight/prematurity blight *Cochliobolus sativus, Fusarium* spp.	6
	Net blotch/*Pyrenophora teres*	4
	Scald/*Rhynchosporium secalis*	3
	Septoria leaf blotch/Septoria passerinii	2
	Chemical injury	9
	Environmental injury	7
Oats	Leaf blotch/*Septoria avenae*	1
	Common root rot/*Fusarium* spp.	1
	Physiological stress	1
Wheat	Common root rot/seedling blight, prematurity blight/ *Cochliobolus sativus, Fusarium* spp.	14
	Head blight/*Fusarium* spp.	16
	Tan spot/*Pyrenophora tritici-repentis*	6
	Glume blotch/*Septoria nodorum*	3
	Black point/*Alternaria spp.*	3
	Wheat Streak Mosaic Virus	2
	Ergot/*Claviceps purpurea*	1
	Loose smut/*Ustilago tritici*	1
	Powdery mildew/*Erysiphe graminis*	1
	Environmental injury	14
	Herbicide injury	14
	Physiological stress	2

Table 2. Summary of plant diseases diagnosed on **forage crops** submitted to the SAF Crop Protection Laboratory in 2001.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Alfalfa	Root/crown rot/*Fusarium* spp., *Rhizoctonia solani*	5
	Black stem/leaf spot/*Phoma medicaginis var.* medicaginis, Pseudomonas sp.	2
	Environmental injury	2
	Chemical injury	1
	Nutrient deficiency	1
Brome grass	Seed rot/*Penicillium sp.*	1
Red Fescue	Head Blight/*Fusarium avenaceum, F. sporotrichioides*	1

Table 3. Summary of plant diseases diagnosed on **fruit crops** submitted to the SAF Crop Protection Laboratory in 2001.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Apple	Fireblight/*Erwinia amylovora*	4
	Iron chlorosis	1
	Environmental injury	1
Currant	Rust/*Puccinia sp.*	1
Raspberry	Spur blight/*Didymella applanata*	1
Saskatoon	Fireblight/Erwinia *amylovora*	3
	Environmental injury	1
	Chemical injury	1
Strawberry	Root Rot/*Cylindrocarpon sp., Fusarium spp., Phytophthora cactorum, Pythium sp., Rhizoctonia solani, Verticillium sp.*	4
	Iron chlorosis	1

Table 4. Summary of plant diseases diagnosed on **oilseed crops** submitted to the SAF Crop Protection Laboratory in 2001.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Canola	Blackspot/*Alternaria* spp.	7
	Root rot/*Fusarium* spp., *Rhizoctonia solani*	5
	Blackleg/*Leptosphaeria maculans*	2
	Sclerotinia stem rot/*Sclerotinia sclerotiorum*	2
	Fusarium wilt/*Fusarium avenaceum, F. oxysporum*	2
	Grey stem/*Pseudocercosporella capsellae*	1
	Downy mildew/*Peronospora parasitica*	1
	Chemical injury	7
	Nutrient deficiency	2
	Environmental injury	2
Flax	Root rot/seedling blight/*Fusarium spp.*	2
	Pasmo/*Septoria linicola*	1
	Chemical injury	3
	Environmental injury	2
Sunflower	Root/basal stem rot/*Fusarium sp.*	1

Table 5. Summary of plant diseases diagnosed on **special crops** submitted to the SAF Crop Protection Laboratory in 2001.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Canaryseed	Leaf mottle/*Septoria triseti*	6
	Fusarium glume infection/*Fusarium sp.*	1
	Environmental injury	1
Caraway	Aster Yellows/Aster yellows phytoplasma	1
	Blossom blight/*Ascochyta sp.*	1
	Root and crown rot/*Fusarium* sp.	1
	Fusarium blossom/seed blight/*Fusarium* sp.	1
Chickpea	Ascochyta blight/*Ascochyta rabiei*	27
	Seedling blight/root rot/*Fusarium* sp., *Rhizoctonia solani*	14
	Fusarium root rot/wilt/*Fusarium oxysporum*	2
	Seed rot/*Penicillium* sp.	2
	Sclerotinia stem rot/*Sclerotinia sclerotiorum*	2
	Botrytis pod rot/stem rot/*Botrytis cinerea*	2
	Chemical injury	4
	Environmental injury	4
Echinacea	Root rot/*Fusarium* spp., *Rhizoctonia solani*	1
Faba bean	Chocolate spot/*Botrytis cinerea*	1
Hops	Environmental injury	1
Lentil	Anthracnose/*Colletotrichum truncatum*	28
	Ascochyta blight/*Ascochyta lentis*	26
	Botrytis stem and pod rot/*Botrytis cinerea*	18
	Sclerotinia stem/pod rot/*Sclerotinia sclerotiorum*	9
	Root rot/seedling blight/*Fusarium* spp., *Rhizoctonia solani*	6
	Secondary stem rot/*Fusarium* spp.	6
	Chemical injury	8
	Environmental injury	4
	Physiological stress	2
	Nutrient stress	1
Mustard	Heat canker	1
	Chemical injury	1
Pea	Root rot/seedling blight/*Fusarium* spp., *Rhizoctonia solani*	11
	Mycosphaerella blight/*Mycosphaerella pinodes*	3
	Powdery mildew/*Erysiphe pisi*	1
	Chemical injury	12
	Environmental injury	3
	Nutrient deficiency	1
Vetch*	Rust/*Uromyces viciae-fabae*	1

*The specimen was not from a vetch crop but from *Vicia americana*, growing as a weed in a lentil crop.

Table 6. Summary of plant diseases diagnosed on **vegetable crops** submitted to the SAF Crop Protection Laboratory in 2001.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Bean	Chemical injury	1
Cabbage	Head rot/*Erwinia or Pseudomonas sp.*(visual I.D.)	1
Carrot	Chemical injury	1
Pepper	Damping off/*Pythium sp.*	1
Potato	Chemical injury	2
	Environmental injury	1
Tomato	Chemical injury	1
	Environmental injury	1

Table 7. Summary of plant diseases diagnosed on **woody ornamental crops** submitted to the SAF Crop Protection Laboratory in 2001.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Ash	Ochre Spreading Tooth/*Steccherinum ochraceum*	1
	Chemical injury	2
	Environmental injury	1
Caragana	Chemical injury	1
Cotoneaster	Chemical injury	1
Crabapple	Fireblight/*Erwinia amylovora*	1
Juniper	Environmental injury	1
Lilac	Environmental injury	1
Maple	Environmental injury	1
Pine	Salinity stress	2
Poplar/Aspen	Cytospora/Valsa canker/*Cytospora* sp./*Valsa* sp.	3
	Environmental injury	2
	Chemical injury	1
	Nutrient deficiency	1
	Salinity stress	1
Spruce	Environmental injury	4
	Chemical injury	3
Willow	Environmental injury	1

Table 8. Summary of plant diseases diagnosed on **turf grass** submitted to the SAF Crop Protection Laboratory in 2001.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Turf	Anthracnose/*Colletotrichum graminicola*	1
	Powdery mildew/*Erysiphe graminis*	1

Table 9. Summary of plant diseases diagnosed on **American elm,** submitted to the Dutch elm disease program of the SAF Crop Protection Laboratory in 2001.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
American elm	Dutch elm disease/*Ophiostoma nova-ulmi*	131
	Dothiorella wilt/*Dothiorella ulmi*	35
	Verticillium wilt/*Verticillium spp.*	9

CROP: Diagnostic Laboratory Report
LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: **2001 MANITOBA CROP DIAGNOSTIC CENTRE LABORATORY SUBMISSIONS**

METHODS: The Manitoba Agriculture and Food Crop Diagnostic Centre provides diagnoses and control recommendations for disease problems of agricultural crops and ornamentals. Samples are submitted by Manitoba Agriculture and Food extension staff, farmers, agri-business, and the general public. Diagnosis is based on visual examination for symptoms and culturing onto artificial media.

RESULTS: Summaries of diseases diagnosed on plants in different crop categories are presented in Tables 1-11.

Table 1. Summary of diseases diagnosed on **cereal crops** submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre in 2001.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Wheat	Septoria leaf spot	*Septoria* spp.	12
	Fusarium head blight	*Fusarium* spp.	12
	Bacterial blights	*Xanthomonas translucens* *Pseudomonas syringae*	10
	Glume blotch	*Leptosphaeria nodorum*	9
	Wheat streak mosaic	Wheat streak mosaic virus	8
	Leaf rust	*Puccinia recondita*	7
	Common root rot	*Fusarium* spp. *Cochliobolus sativus*	6
	Tan spot	Pyrenophora tritici-repentis	4
	Black head mould	*Alternaria* sp./*Cladosporium* sp.	2
	Spot blotch	*Cochliobolus sativus*	2
	Ergot	*Claviceps purpurea*	1
	Stripe rust	*Puccinia striiformis*	1
	Physiological leaf spot		8
	Environmental injury		32
	Herbicide injury		14
	Nutrient deficiency		2
Barley	Common root rot	*Fusarium* spp. *Cochliobolus sativus*	13
	Fusarium head blight	*Fusarium* spp.	7
	Spot blotch	*Helminthosporium sativum*	7
	Net blotch	*Pyrenophora teres*	6
	Browning root rot	*Pythium* spp.	4
	Septoria leaf spot	*Septoria* spp.	3
	Bacterial blight	*Pseudomonas syringae*	1
	True loose smut	*Ustilago nuda*	1
	Powdery mildew	*Erysiphe graminis*	1
	Environmental injury		6
	Herbicide injury		7
	Nutrient deficiency		1
Oats	Bacterial blight	*Pseudomonas syringae*	7
	Septoria leaf spot	*Septoria avenae*	3
	Common root rot	*Fusarium* sp.	1
	Fusarium head blight	*Fusarium* sp.	1
	Leaf rust	*Puccinia coronata*	1
	Environmental injury		4
	Nutrient deficiency		1
	Herbicide injury		1

Table 2. Summary of diseases diagnosed on **forage legume crops** submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre in 2001.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Alfalfa	Spring black stem and leaf spot	*Phoma medicaginis*	9
	Common leaf spot	*Pseudopeziza medicaginis*	8
	Cercospora leaf spot	*Cercospora* sp.	2
	Mosaic	virus, unspecified	2
	Sclerotinia stem rot	*Sclerotinia sclerotiorum*	2
	Yellow leaf spot	*Leptotrochila medicaginis*	2
	Botrytis blossom blight	*Botrytis cinerea*	1
	Leptosphaerulina leaf spot	*Leptosphaerulina briosiana*	1
	Root rot	*Fusarium* sp., *Rhizoctonia* sp.	1
	Stemphylium leaf spot	*Stemphylium botryosum*	1
	Environmental injury		4
	Nutrient deficiency		4
Trefoil	Powdery mildew	unidentified	1

Table 3. Summary of diseases diagnosed on **grasses** submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre in 2001.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Lawn and Turf	Anthracnose	*Colletotrichum graminicola*	9
	Melting out	*Drechslera poae*	4
	Root rot	*Pythium* spp.	3
	Leaf spots	various, unidentified	2
	Leptosphaerulina leaf blight	*Leptosphaerulina* sp.	2
	Necrotic ring spot	*Leptosphaeria korrae*	1
Meadow bromegrass	Root rot	unidentified	1
Orchard grass	Ascochyta leaf blight	*Ascochyta* sp.	1
	Phyllosticta leaf blight	*Phyllosticta* sp.	1
Perennial ryegrass	Leaf spot	unidentified	1
Tall fescue	Leaf spot	unidentified	1
Timothy	Anthracnose	*Colletotrichum graminicola*	2
	Purple eye spot	*Heterosporium phlei*	2

Table 4. Summary of diseases diagnosed on **greenhouse crops** submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre in 2001.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Dianthus	Storage rot; stem rot	*Colletotrichum* sp.	1
Geranium	Blackleg	*Pythium* sp.	1
Marigold	Damping off	*Fusarium* sp.	1
Onion	Damping off	*Fusarium* sp.	1
Pepper	Damping off	*Fusarium* sp.	1
Petunia	Virus	Suspect INSV or TSWV	1

Table 5. Summary of diseases diagnosed on **vegetable crops** submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre in 2001.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Bean	Alternaria pod spot	*Alternaria* sp.	1
	Bacterial blight	unidentified	1
Cabbage	Fusarium root rot	*Fusarium* sp.	1
	Alternaria leaf spot	*Alternaria* sp.	1
Carrot	Cercospora leaf spot	*Cercospora carotae*	2
	Alternaria leaf blight	*Alternaria dauci*	2
Cauliflower	Black rot	*Xanthomonas campestris*	1
Celery	Septoria leaf spot	*Septoria apiicola*	1
Corn	Fusarium root rot	*Fusarium* sp.	1
	Nutrient deficiency		1
	Environmental injury		1
Garlic	Basal plate rot	*Fusarium oxysporum* f. sp. *cepae*	1
Onion	Purple blotch	*Alternaria porri*	1
	Botrytis neck rot	*Botrytis* sp.	2
	Alternaria leaf spot	*Alternaria* sp.	1
	Fusarium basal plate rot	*Fusarium oxysporum*	7
	Root rot	unidentified	1
	Penicillium blue mould	*Penicillium oxalicum*	3
Pea	Herbicide injury		3
Pepper	Phoma rot	*Phoma* sp.	1
	Stem rot	unidentified Coelomycete	1
Shallots	Neck rot	*Botrytis* sp.	1
Tomato	Septoria leaf spot	*Septoria lycopersici*	1
	Stem canker	*Fusarium* sp.	1
	Physiological disorders		2

Table 6. Summary of diseases diagnosed on **oilseed crops** submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre in 2001.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Flax	Fusarium root rot	*Fusarium* spp.	4
	Pasmo	*Septoria linicola*	2
	Environmental injury		2
	Herbicide injury		9
Sunflower	Stem rot	*Phoma* spp.	2
	Stained kernels	*Alternaria zinniae*	1
	Environmental injury		4
	Herbicide injury		8
	Nutrient deficiency		1
Canola	Downy mildew	*Peronospora parasitica*	6
	Black spot	*Alternaria* spp.	4
	Blackleg	*Leptosphaeria maculans*	1
	Fusarium root rot	*Fusarium avenaceum, F. oxysporum*	1
	Root rot	*Rhizoctonia solani*	1
	Sclerotinia stem rot	*Sclerotinia sclerotiorum*	1
	Environmental injury		15
	Herbicide injury		22
	Nutrient deficiency		4

Table 7. Summary of diseases diagnosed on **herbaceous ornamentals** submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre in 2001.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Allium	Bulb rot	*Penicillium* sp.	1
Amaryllis	Bulb rot	*Fusarium* sp.	1
Calla lily	Storage rot	*Penicillium* sp.	1
Coreopsis	Storage rot	*Botrytis cinerea, Mucor* sp.	1
Delphinium	Crown rot	*Phoma* sp.	1
Fritillaria	Bulb rot	*Fusarium* sp.	1
Hollyhock	Storage rot	*Erwinia carotovora*	1
Lily	Bulb rot	*Rhizopus* sp., *Penicillium* sp.	1
Nectaroscordum	Bulb rot	*Penicillium* sp.	1
Scabiosa	Storage rot	*Botrytis cinerea*	1
Tulip	Bulb rot	*Fusarium* sp.	3

Table 8. Summary of diseases diagnosed on **trees, shelterbelts & woody ornamentals** submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre in 2001.

CROP	SYMPTOMS/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Ash	Anthracnose	*Discula fraxinea*	5
	Leaf spot	*Cylindrosporium* sp.	1
	Virus	undetermined	1
Cotoneaster	Canker	Cytospora sp.	1
Elm	Black spot	*Gloeosporium ulmeum*	9
	Canker	*Botryodiplodia* sp.	2
	Canker	*Botryosphaeria dothidea*	2
	Canker	*Tubercularia* sp.	1
	Dutch elm disease	*Ophiostoma ulmi*	15
	Dothiorella wilt	*Dothiorella ulmi*	1
Hawthorn	Rust	*Gymnosporangium* sp.	1
Juniper	Canker	*Sphaeropsis* sp.	1
	Tip blight	*Phomopsis juniperovora*	1
Maple	Anthracnose	*Gloeosporium apocryptum*	3
	Canker	*Sphaeropsis* sp.	1
	Wood rot	undetermined	1
Oak	Anthracnose	*Apiognomonia quercina*	1
Poplar	Canker	*Cytospora* sp.	2
	Canker	*Tubercularia* sp.	1
	Canker	undetermined	1
	Ink spot	*Ciborinia whetzelii*	1
	Leaf rust	*Melampsora* sp.	1
	Leaf spot	*Septoria populicola*	1
	Leaf spot	*Marssonina* sp.	2
Spruce	Cytospora canker	*Leucostoma kunzei*	4
	Needle cast	*Rhizosphaera kalkhoffii*	13
	Needle blight	*Lirula* sp.	5
	Needle rust	*Chrysomyxa* sp.	2
	Root rot	*Fusarium solani, Cylindrocarpon* sp.	2
	Tip blight	*Sphaeropsis* sp.	1

Table 9. Summary of diseases diagnosed on **potato crops** submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre in 2001.

SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Late blight	*Phytophthora infestans*	36
Powdery scab	*Spongospora subterranea*	6
Fusarium dry rot	*Fusarium* spp.	6
Early blight	*Alternaria solani*	4
Bacterial soft rot	*Erwinia carotovora* subsp. *carotovora*	4
Fusarium wilt	*Fusarium* spp.	3
Verticillium wilt	*Verticillium dahliae*	3
Tuber rot	*Phytophthora* sp.	3
Pink rot	*Phytophthora erythroseptica*	2
Blackleg	*Erwinia carotovora* subsp. *atroseptica*	2
Black scurf	*Rhizoctonia solani*	2
Pink eye	*Pseudomonas fluorescens*	2
Black dot	*Colletotrichum coccodes*	1
Silver scurf	*Helminthosporium solani*	1
Botrytis	*Botrytis cinerea*	1
Skin spot	*Polyscytalum pustulans*	1
Physiological disorders		2
Environmental injury		5
Undetermined		4

Table 10. Summary of diseases diagnosed on **special field crops** submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre in 2001.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Canaryseed	Root rot	*Fusarium* spp. and *Pythium* spp.	5
	Septoria leaf mottle	*Septoria triseti*	4
	Fusarium head blight	*Fusarium* spp.	3
	Root rot	undetermined	1
	Environmental injury		1
	Herbicide injury		2
Corn	Ear moulds	*Rhizopus*, *Aspergillus*, *Fusarium*, and *Alternaria* spp.	2
Coriander	Blossom blight	*Fusarium* sp.	1
	Fusarium blight	*Fusarium* sp.	1
	Root rot	*Fusarium* sp.	1
Faba bean	Alternaria leaf and pod spot	*Alternaria* spp.	3
	Root rot	*Fusarium* sp.	3
	Chocolate spot	*Botrytis* sp.	2
	Botrytis flower blast	*Botrytis* sp.	1
	Virus	undetermined	1
	Herbicide injury		3
	Nutrient deficiency	iron chlorosis	1

Field bean	Common blight	*Xanthomonas campestris* pv. *phaseoli*	8
	Root rot/stem canker	*Fusarium* spp., *F. solani; Rhizoctonia solani*	8
	Halo blight	*Pseudomonas syringae* pv. *phaseolicola*	7
	Brown spot	*Pseudomonas syringae* pv. *syringae*	6
	Anthracnose	*Colletotrichum lindemuthianum*	6
	Alternaria leaf spot	*Alternaria* spp.	5
	Bacterial blight	*Pseudomonas syringae*	4
	Leaf spot	undetermined	1
	Rust	*Uromyces phaseoli*	1
	Wilt (fusarium yellows)	*Fusarium oxysporum* f.sp. *phaseoli*	1
	Environmental injury		7
	Herbicide injury		4
	Nutrient deficiency		1
Field pea	Anthracnose	*Colletotrichum pisi*	1
	Root rot	undetermined	1
	Septoria leaf spot	*Septoria pisi*	1
Millet	Bacterial leaf streak	unidentified	1
Soybean	Bacterial blight	*Pseudomonas syringae* pv. *glycinea*	5
	Root rot	*Fusarium* spp., *Pythium* spp.	2
	Septoria leaf spot (brown spot)	*Septoria glycines*	2
	Downy mildew	*Peronospora manshurica*	1
	Virus	undetermined	1
	Environmental injury		1
	Herbicide injury		1
	Nutrient deficiency	iron chlorosis	1

Table 11. Summary of diseases diagnosed on **fruit crops** submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre in 2001.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Apple	Fire blight	*Erwinia amylovora*	1
	Canker	unidentified	1
	Apple scab	*Venturia inaequalis*	1
	Herbicide injury		2
Grape	Phomopsis cane and leaf spot	*Phomopsis* sp.	1
Raspberry	Anthracnose	*Elsinoe veneta*	1
	Bacterial blight	*Pseudomonas syringae*	1
	Spur blight	*Didymella applanata*	1
	Environmental injury		1
Sea Buckthorn	Root necrosis	*Fusarium* sp.	1
Strawberry	Black root rot	*Fusarium* spp., *Pythium* spp.; *Rhizoctonia* sp.	4
	Common leaf spot	*Mycosphaerella fragariae*	1
	Hainesia leaf spot	*Hainesia lythri*	1
	Root rots	*Rhizoctonia* sp., *Fusarium* spp.	3
	Cylindrocarpon root rot	*Cylindrocarpon* sp.	1
	Coniella fruit rot	*Coniella castaneicola*	1
	Nutrient deficiency	iron chlorosis	1
Saskatoon	Powdery mildew	*Podosphaera clandestina*	1
	Entomosporium leaf and berry spot	*Entomosporium mespili*	1
	Canker	*Cytospora* sp.	1
	Root rot	*Fusarium* sp.	1
	Nutrient deficiency		1
Chokecherry	Environmental injury		1
Plum	Plum pockets	*Taphrina communis*	2
	Herbicide injury		1
Cherry	Herbicide injury		1
Nanking cherry	Canker	unidentified	1
Pear	Environmental injury		1

Cereals / Céréales

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba and eastern Saskatchewan

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TITLE / TITRE: CROWN RUST OF OAT IN WESTERN CANADA IN 2001

INTRODUCTION AND METHODS: Surveys for incidence and severity of oat crown rust (caused by *Puccinia coronata* Cda f. sp. *avenae* Eriks.) were conducted in southern Manitoba from early July to late August, and in eastern Saskatchewan in mid-August. Crown rust collections were obtained from wild oat (*Avena fatua* L.) and commercially-grown oat in farm fields, and from susceptible and resistant oat lines and cultivars grown in uniform rust nurseries. The nurseries were located at Brandon, Emerson, and Morden, MB, and at Indian Head, SK. Virulence phenotypes of single-pustule isolates established from the rust collections were identified, using 16 single-gene backcross lines carrying crown rust resistance genes *Pc38, Pc39, Pc40, Pc45, Pc46, Pc48, Pc50, Pc51, Pc52, Pc54, Pc56, Pc58, Pc59, Pc62, Pc64,* and *Pc68* as the primary differential hosts (Chong et al. 2000). Single-gene lines with *Pc94* and *Pc96* were included in the differential sets as supplemental differentials. These two genes are being used in the oat breeding program at the Cereal Research Centre, Winnipeg.

RESULTS AND COMMENTS: Crown rust of oat was very light in southern Manitoba in July but became severe and widespread throughout southern Manitoba and south-eastern Saskatchewan during August. Crown rust, ranging in severity from 70-90% (southern Manitoba) and 30-90% (south-eastern Saskatchewan), was commonly observed in fields of susceptible cultivars and on wild oat. Triple Crown and AC Assiniboia currently are the two most popular cultivars grown in Manitoba, occupying 32% and 42%, respectively, of the oat acreage in 2001. Released to growers in 1998, Triple Crown was resistant to crown rust due to presence of the *Pc48* gene. In 2001, late-planted fields of this cultivar were severely rusted, indicating that the *Pc48* gene was no longer effective. Reductions in grain yield and bushel weight from an average of 90 bu/ac and 38 lb/bu, respectively, in early planted fields, to as low as 10 bu/ac and 12 lb/bu, have been reported in late seeded fields severely affected by crown rust. Fields of susceptible cultivars, including Triple Crown, seeded during early May, were able to escape damage due to initial low rust inoculum during July. In contrast, only light crown rust infections were observed in fields of AC Assiniboia late in the growing season, indicating that the *Pc68* gene still provides adequate protection for this cultivar against crown rust since its release in 1995.

To date, 127 single-pustule isolates of *P. coronata* f. sp. *avenae*, established from the collections obtained in Manitoba and Saskatchewan in 2001, have been evaluated for their virulence phenotypes. Eighty isolates had virulence for both *Pc38* and *Pc39*, a resistance gene combination present in cultivars Dumont, Robert, Riel, Belmont, AC Marie, AC Preakness, and AC Rebel. Twenty-seven isolates had virulence for *Pc48*, present in Triple Crown. Only two isolates were found to have virulence for the resistance gene combination *Pc38,39,68*, present in the cultivars AC Assiniboia, AC Medallion, AC Pinnacle, AC Ronald and AC Gwen. Four of the 127 isolates had virulence to *Pc96* and none of the 127 isolates had virulence for *Pc94*, a highly effective resistance gene derived from the a diploid *Avena strigosa* oat accession.

REFERENCES:
Chong, J., K.J. Leonard, and J.J. Salmeron. 2000. A North American system of nomenclature for *Puccinia* f. sp. *avenae*. Plant Dis. 84: 580-585.

CROP / CULTURE: Barley

LOCATION / RÉGION: Saskatchewan

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TITLE / TITRE: FUSARIUM HEAD BLIGHT IN BARLEY IN SASKATCHEWAN IN 2001

INTRODUCTION AND METHODS: The incidence and severity of fusarium head blight (FHB) was assessed in 45 2-row and 21 6-row barley fields from 16 crop districts (CDs) in Saskatchewan. Some of the most drought-affected areas in the province were not sampled. Heads from 50 plants, at milk to dough stages, were collected randomly from each field and sent to the Saskatchewan Agriculture and Food, Crop Protection Laboratory in Regina for disease assessment, and pathogen isolation and identification. A FHB index (percent heads affected x mean severity of infection)/100 was determined for each field. An average FHB index for infected fields in each CD, and for CDs grouped by soil zone (Zone I=Brown, Zone II=Dark Brown and Zone III=Black/Grey soils) was calculated. Glumes/kernels from heads with symptoms were surface sterilized in 0.6% NaOCl for 1 min. and plated on potato dextrose agar for identification of *Fusarium* spp.

RESULTS AND COMMENTS: Overall, 74% of barley fields surveyed were affected by FHB, similar to 2000 but somewhat higher than in other years (65% in 1999, 59% in 1998) (Table 1; Fernandez et al. 1999; 2000; 2001). The mean FHB index of 1.5% was higher than in 2000 (0.6%) and 1999 (1.0%) but similar to that in 1998 (1.4%). However, this was due to high disease pressure, resulting from high humidity and warm conditions only in the southeast (CDs 1A, 1B, 5A) which led to high FHB levels in that region. The rest of the province experienced lower than average precipitation, especially in the southwest, and little FHB developed. As in previous years, the percentage of fields with FHB was lower in 2-row (71%) than in 6-row (81%) barley. In 2001 the FHB index was lower for 2-row (1.0%) than for 6-row (2.5%) barley.

Fusarium sporotrichioides was present in the greatest number of fields, followed by *F. poae* and *F. avenaceum*, similar to the results from the 2000 survey (Table 1; Fernandez et al. 2001).

We gratefully acknowledge the participation of Saskatchewan Agriculture and Food extension agrologists in this survey, and financial support by the Agriculture Development Fund.

REFERENCES:

Fernandez, M.R, P.G. Pearse, G. Holzgang, and G.R. Hughes, 2001. Fusarium head blight in barley in Saskatchewan in 2000. Can. Plant Dis. Surv. 81: 61-62. (http://res2.agr.ca/london/pmrc)

Fernandez, M.R, P.G. Pearse, G. Holzgang, and G.R. Hughes, 2000. Fusarium head blight in barley in Saskatchewan in 1999. Can. Plant Dis. Surv. 80: 32-33. (http://res2.agr.ca/london/pmrc)

Fernandez, M.R, G. Holzgang, M.J. Celetti, and G. Hughes, 1999. The incidence of fusarium head blight in barley, common wheat and durum wheat grown in Saskatchewan during 1998. Can. Plant Dis. Surv. 79: 79-82. (http://res2.agr.ca/london/pmrc/english/report/disease99.html)

Table 1. Incidence and severity (FHB index) of fusarium head blight in 2-row and 6-row barley, and frequency of isolation of *Fusarium* spp. in Saskatchewan in 2001.

SOIL ZONE/ CROP DISTRICT	NO. AFFECTED FIELDS/ TOTAL FIELDS		FHB INDEX[1]		*FUSARIUM* SPP.					
					avena ceum	*culm orum*	*equis eti*	*gramin earum*	*poae*	*sporot richioi des*
	2-row	6-row	2-row	6-row						
Zone I										
3AS	1/1	-	0.2	-	0	0	0	0	1	0
3BN	2/4	-	0.1	-	0	0	0	0	1	1
4A	1/2	-	0.2	-	0	0	0	0	0	1
7A	3/5	-	0.8	-	0	0	0	0	2	3
Total or mean:	7/12	-	0.4	-	0	0	0	0	4	5
Zone II										
1A	3/3	1/1	4.2	33.5	1	0	0	2	2	2
2A	1/1	1/1	0.7	0.6	0	0	0	1	2	2
2B	1/1	1/1	0.6	0.3	2	0	0	2	1	2
6A	0/2	-	-	-	0	0	0	0	0	0
7B	2/6	-	0.2	-	0	0	1	0	1	1
Total or mean:	7/13	3/3	2.1	11.5	3	0	1	5	6	7
Zone III										
1B	3/3	3/3	1.6	0.7	1	0	0	0	6	6
5A	2/2	1/1	1.9	0.5	1	0	0	1	3	2
5B	2/3	3/3	0.3	0.2	2	1	1	0	1	5
8A	2/2	1/1	0.3	0.8	2	0	0	0	2	3
8B	1/1	0/2	0.4	-	1	0	0	0	0	1
9A	4/5	5/6	0.4	0.6	6	1	0	0	6	8
9B	4/4	1/2	0.6	0.1	0	0	0	0	5	5
Total or mean:	18/20	14/18	0.8	0.5	13	2	1	1	23	30
Overall total or mean:										
	32/45	**17/21**	**1.0**	**2.5**	**16**	**2**	**2**	**6**	**33**	**42**
Overall % fields:					**33**	**4**	**4**	**12**	**67**	**86**

[1] FHB index calculated as (percent of heads affected x mean severity of infection)/100.

CROP / CULTURE: Durum wheat
LOCATION / RÉGION: Saskatchewan

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TITLE / TITRE: LEAF SPOT DISEASES OF DURUM WHEAT IN SASKATCHEWAN IN 2001

INTRODUCTION AND METHODS: A survey for foliar diseases of durum wheat was conducted between the milk and dough growth stages in 11 crop districts (CD) in Saskatchewan. Some of the most drought-affected areas in the province were not surveyed. In each of 41 fields, 10 flag leaves were collected at random and air dried at room temperature. Percent leaf area affected by leaf spots (severity) was recorded for each leaf. An average percent leaf area with leaf spots was calculated for each field and CD. Surface disinfested leaf pieces were plated on water agar for identification and quantification of leaf spotting pathogens.

RESULTS AND COMMENTS: Leaf spots were observed in fewer durum wheat fields (66%) than in the past few years (100%) (Fernandez et al., 1999; 2000; 2001). Leaf spot severities in individual fields ranged from 0% to 18%. The highest mean leaf spot severities were in CDs 1A and 2A (south-east) (Table 1). The south-east had the highest moisture levels during the growing season whereas most of the rest of the province experienced drought conditions.

As in previous years, the most prevalent leaf spotting pathogen was *Pyrenophora tritici-repentis* (tan spot), both in the number of fields where it was present and in the percent leaf area colonized (Table 1). *Septoria* spp. were less commonly isolated than in past years, a reflection of dry conditions. Among these, the most common was *S. avenae* f. sp. *triticea*. *Cochliobolus sativus* (spot blotch) was mostly present in the south-east (CDs 1A, 2A).

We gratefully acknowledge the participation of Saskatchewan Agriculture and Food extension agrologists in this survey, and financial support from the Agriculture Development Fund.

REFERENCES:

Fernandez, M.R., G.R. Hughes and P.G. Pearse, 2001. Leaf diseases of durum wheat in Saskatchewan in 2000. Can. Plant Dis. Surv. 81: 86-87. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Fernandez, M.R., G.R. Hughes and P.G. Pearse, 2000. Leaf diseases of durum wheat in Saskatchewan in 1999. Can. Plant Dis. Surv. 80: 52-53. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Fernandez, M.R., M.J. Celetti, and G. Hughes. 1999. Leaf diseases of common and durum wheat in Saskatchewan in 1998. Can. Plant Dis. Surv. 79: 86-89.
(http://res2.agr.ca/london/pmrc/english/report/disease99.html)

Table1. Distribution and severity of leaf spot diseases, and estimate of the percent flag leaf area colonized by leaf spot fungi, in durum wheat fields in Saskatchewan in 2001.

Crop District	No. fields affected/ surveyed	Mean severity[1]	LEAF SPOT PATHOGENS				
			P. tritici-repentis	*S. nodorum*	*S. tritici*	*S. avenae f.sp. tritcea*	*C. sativus*
1A	5/5	16	62/5[2]	6/2	-	37/3	13/5
2A	2/2	17	88/2	-	-	1/1	12/2
2B	4/4	9	78/4	8/1	-	24/3	9/1
3A-N	2/2	5	100/1	-	-	-	-
3A-S	3/4	7	95/3	1/1	-	9/1	-
3B-N	6/13	1	96/6	4/2	2/4	2/1	2/1
4A	0/3	0	-	-	-	-	-
6A	3/3	6	28/1	30/1	-	39/1	3/1
6B	1/1	5	83/1	-	-	6/1	11/1
7A	0/3	0	-	-	-	-	-
8B	1/1	1	40/1	2/1	-	20/1	38/1
Mean/total:	**27/41**	**5**	**80/24**	**8/8**	**2/4**	**22/12**	**13/11**

[1] percent flag leaf area infected.
[2] percent leaf area colonized by fungus / number of fields where it occurred.

CROP / CULTURE: Wheat
LOCATION / RÉGION: Saskatchewan

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TITLE/ TITRE: FUSARIUM HEAD BLIGHT IN COMMON AND DURUM WHEAT IN SASKATCHEWAN IN 2001

INTRODUCTION AND METHODS: The incidence of fusarium head blight (FHB) was assessed in 124 common wheat (Canada Western Red Spring and Canada Prairie Spring) and 38 durum wheat (Canada Western Amber Durum) fields from 18 crop districts (CDs) in Saskatchewan. Some of the most drought-affected areas in the province were not sampled. Heads from 50 plants, between milk and dough stages, were collected randomly from each field and sent to the Crop Protection Laboratory in Regina for disease assessment, pathogen isolation and identification. A FHB index (% heads affected x mean % severity of infection/100) was determined for each field. An average FHB index for affected fields in each CD, and for CDs grouped by soil zone (Zone I=Brown, Zone II=Dark Brown and Zone III=Black/Grey soils) was calculated. Glumes/kernels from heads with symptoms were surface sterilized in 0.6% NaOCl solution for 1 min. and plated on potato dextrose agar for identification of *Fusarium* spp.

RESULTS AND COMMENTS: FHB was found in a total of 43% of the common and 50% of the durum wheat fields surveyed in Saskatchewan in 2001 (Table 1). This is lower than the ranges of prevalence from 1998 to 2000 of 53-62% for common wheat and 56-60% for durum wheat (Fernandez et al., 1999; 2000; 2001). Mean FHB indexes were also higher in 2001 (2.9% in common, 4.5% in durum wheat) than in the previous years (0.5 to 2.3%), except for 1998 for common wheat (3.0%). The higher mean FHB indexes were attributed to high disease severity in the south-east, especially in CD 1A. This area experienced high humidity and warm conditions during flowering and seed formation, whereas most of the rest of the province was under drought conditions. As in previous years, the percentage of infected fields and FHB index were the lowest in Zone I.

The most commonly isolated *Fusarium* species was *F. sporotrichioides*, followed by *F. graminearum, F. avenaceum* and *F. poae* (Table 2). *F. graminearum* was found in more fields in 2001 (40%) than in 1999 (6%) or 2000 (19%) but was as prevalent as in 1998 (38%). This pathogen was more common in CD 1A in Zone II than in any other CD. All species were less prevalent in Zone I than in the other two zones.

We gratefully acknowledge the participation of Saskatchewan Agriculture and Food extension agrologists in the survey, and financial support by the Agriculture Development Fund.

REFERENCES:

Fernandez, M.R, P.G. Pearse, G. Holzgang, and G.R. Hughes, 2001. Fusarium head blight in common and durum wheat in Saskatchewan in 2000. Can. Plant Dis. Surv. 81: 83-85.
(http://res2.agr.ca/london/pmrc/english/report/repmenu.html

Fernandez, M.R, P.G. Pearse, G. Holzgang, and G.R. Hughes, 2000. Fusarium head blight in common and durum wheat in Saskatchewan in 1999. Can. Plant Dis. Surv. 80: 57-59.
(http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Fernandez, M.R, G. Holzgang, M.J. Celetti, and G. Hughes. 1999. The incidence of fusarium head blight in barley, common wheat and durum wheat grown in Saskatchewan during 1998. Can. Plant Dis. Surv. 79: 79-82.(http://res2.agr.ca/london/pmrc/english/report/disease99.html)

Table 1. Incidence of fusarium head blight and disease severity (FHB index) in common and durum wheat in Saskatchewan in 2001.

SOIL ZONE	CROP DISTRICT	COMMON WHEAT		DURUM WHEAT	
		No. fields affected/ total fields	FHB [1] Index	No. fields affected/ total fields	FHB Index
Zone I	3A-N	-	-	2/2	<0.1
	3A-S	1/3	0.1	2/4	<0.1
	3B-N	0/3	-	2/13	0.2
	4A	1/5	0.1	0/3	-
	7A	0/5	-	-	-
Total or mean:		2/16	0.1	6/22	0.1
Zone II	1A	8/9	15.2	5/5	15.2
	2A	2/5	2.7	1/2	0.9
	2B	1/5	0.1	4/4	1.1
	6A	2/4	0.2	1/3	2.9
	6B	0/1	-	1/1	<0.1
	7B	3/13	0.2	-	-
Total or mean:		16/37	8.9	12/15	7
Zone III	1B	6/8	0.3	-	-
	5A	2/4	0.6	-	-
	5B	4/12	0.3	-	-
	8A	6/11	0.3	-	-
	8B	4/9	0.3	1/1	0.2
	9A	6/11	0.5	-	-
	9B	7/16	0.1	-	-
Total or mean:		35/71	0.3	1/1	0.2
Overall total or mean:		**53/124**	**2.9**	**19/38**	**4.5**

[1] FHB index calculated as (% heads affected x mean % severity of infection)/100.

Table 2. Number of fields where *Fusarium* spp. were isolated from common and durum wheat in Saskatchewan in 2001.

Soil zone/ crop district	No. affected fields	*Fusarium* spp.					
		avenaceum	*culmorum*	*equiseti*	*graminearum*	*poae*	*sporotrichioides*
Zone I							
3A-N	2	0	0	0	0	1	1
3A-S	3	0	0	0	0	0	3
3B-N	2	0	1	0	0	0	2
0.1666667	1	0	0	0	0	0	1
Total:	8	0	1	0	0	1	7
% fields:		0	13	0	0	13	88
Zone II							
0.041667	13	3	3	2	12	4	6
0.083333	3	2	1	0	3	1	0
2B	5	3	0	0	4	1	4
0.25	3	2	1	0	2	0	2
6B	1	0	0	0	0	0	1
7B	3	0	0	0	0	1	2
Total:	28	10	5	2	21	7	15
% fields:		36	18	7	75	25	54
Zone III							
1B	6	1	1	0	4	3	6
0.2083333	2	1	0	1	1	2	1
5B	4	1	0	0	1	1	3
0.3333333	6	3	1	0	1	1	4
8B	5	1	1	2	1	0	3
0.375	6	2	0	3	0	3	5
9B	7	4	0	0	0	2	2
Total:	36	13	3	6	8	12	24
% fields:		36	8	17	22	33	67
Overall total:	**72**	**23**	**9**	**8**	**29**	**20**	**46**
Overall % fields:		**32**	**13**	**11**	**40**	**28**	**64**

CROP / CULTURE: Common wheat
LOCATION / RÉGION: Saskatchewan

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TITLE/ TITRE: **LEAF SPOT DISEASES OF COMMON WHEAT IN SASKATCHEWAN IN 2001**

INTRODUCTION AND METHODS: A survey for foliar diseases of common wheat was conducted in Saskatchewan between the milk and dough growth stages in 11 crop districts (CD): 1A, 1B, 2A, 2B (south-east), 5A, 5B (east-central), 3A-S, 3B-N, 4A (south-west), 7A, 7B (west-central). Some of the most drought-affected areas were not surveyed. In each of 60 fields (57 hard red spring and 3 Canada Prairie Spring wheat), 10 flag leaves were collected at random and air dried at room temperature. Percent leaf area affected by leaf spots (severity) was recorded for each leaf. An average percent leaf area with leaf spots was calculated for each field and CD. Surface disinfested leaf pieces were plated on water agar for identification and quantification of leaf spotting pathogens.

RESULTS AND COMMENTS: Leaf spots on the flag leaf were observed in fewer common wheat fields in 2001 (67%) than in 2000 (97%) (Hughes et al. 2001). Mean leaf spot severity was also lower in 2001 (4%) than in 2000 (over 6%). Leaf spot severities in individual fields ranged from 0% in most of the fields surveyed in western areas to 25% in the southeast (CD 1A). The highest mean leaf spot severities were found in some of the eastern CDs (Table 1). The south-east had the highest moisture levels during the growing season whereas most of the rest of the province experienced drought conditions.

As in 2000, the most prevalent leaf spotting pathogen in 2001 was *Pyrenophora tritici-repentis* (tan spot), both in the number of fields where it was present and in the percent leaf area affected (Table 1). In 2001, *Cochliobolus sativus* (spot blotch) was the second most common fungus, and it was found at the highest levels in the eastern CDs. *Septoria* spp. were less common, with *S. tritici* being the most frequently identified. Comparatively, in 2000, *S. tritici* was more frequently identified than *C. sativus*.

Leaf rust was present at trace to light levels in a few of the fields surveyed in the southeast.

We gratefully acknowledge the participation of Saskatchewan Agriculture and Food extension agrologists in this survey, and financial support from Agriculture Development Fund.

REFERENCES:
Hughes, G.R, M.R. Fernandez and P.G. Pearse. 2001. Leaf diseases of common wheat in Saskatchewan in 2000. Can. Plant Dis. Surv. 81: 91.
(http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Table 1. Distribution and severity of leaf spotting diseases, and estimate of the percentage of flag leaf area colonized by leaf spotting fungi, in common wheat fields in Saskatchewan in 2001.

Crop District	No. fields affected /surveyed	Mean severity[1]	Leaf spot pathogens				
			P. tritici-repentis	*S. nodorum*	*S. tritici*	*S. avenae f.sp. triticea*	*C. sativus*
1A	9/9	15	47/9[2]	6/4	11/5	25/5	30/9
1B	9/10	3	65/8	6/4	19/5	6/4	16/9
2A	5/5	3	86/5	7/2	10/2	10/1	6/3
2B	4/4	7	49/4	19/1	55/3	20/1	-
3A-S	3/3	2	86/3	7/1	1/1	1/1	14/1
3B-N	0/3	0	-	-	-	-	-
4A	0/5	0	-	-	-	-	-
5A	4/4	2	60/4	9/4	11/4	17/2	13/3
5B	1/1	5	69/1	-	-	-	31/1
7A	0/3	0	-	-	-	-	-
7B	5/13	1	86/5	9/2	6/2	10/2	7/3
Mean /total:	**40/60**	**4**	**66/39**	**8/18**	**18/22**	**15/16**	**18/29**

[1] percent flag leaf area infected.
[2] percent leaf area with lesions from which fungus was isolated / number of fields where it occurred.

CROP / CULTURE: Barley, Oat and Wheat
LOCATION / RÉGION: Manitoba and eastern Saskatchewan

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TITLE/ TITRE: STEM RUSTS OF CEREALS IN WESTERN CANADA IN 2001

INTRODUCTION AND METHODS: Surveys of fields and trap nurseries of barley, oat and wheat for incidence and severity of stem rust *(Puccinia graminis* Pers. f. sp. *tritici* Eriks. & E. Henn. and *P. graminis* Pers. f. sp. *avenae* Eriks. & E. Henn.) were conducted in July, August, and September 2001. Infected stem tissue samples obtained from fields and trap nurseries were evaluated for pathotypic specialization on appropriate sets of host differential lines.

RESULTS AND COMMENTS: Environmental conditions were highly unfavorable for stem rust infection in western Canada in 2001 due to extremely dry conditions, with the exception of central and eastern Manitoba. Stem rust infection on susceptible lines in trap nurseries was very low or absent in Saskatchewan, but was higher (20-40% severity) in nurseries in central and eastern Manitoba. All spring wheat cultivars recommended for production in Manitoba and Saskatchewan have excellent resistance to stem rust, and no stem rust infection was observed in any commercial wheat fields. Barley cultivars recommended for production in Manitoba and Saskatchewan are susceptible to stem rust race QCCJN. Race QCCJN was predominant (44%) in the wheat stem rust population in the Prairies in 2001, but stem rust severity was low (<3%) in commercial barley fields.

Oat cultivars recommended for production in Manitoba and Saskatchewan are susceptible to races NA67 and NA76. Additionally, the oat cultivar 'Triple Crown' is susceptible to all races currently found in the oat stem rust population and was widely grown (32% of the acreage) in Manitoba in 2001. Severe stem rust infection was noted in commercial oat fields near Winnipeg. Some late-planted commercial crops sustained yield losses estimated to exceed 50%, but the damage attributable to stem rust was confounded by concurrent high levels of oat crown rust infection. Moderate to severe levels of stem rust infection developed during late summer-early fall on wild barley *(Hordeum jubatum* L.), and wild oat *(Avena fatua* L.).

No new races of *P. graminis* f. sp. *tritici* were found that threaten Canadian wheat or barley production. The return of race QCCJN to predominance in the stem rust population does raise concern for the 2002 growing season and should be carefully monitored in the 2002 barley crop. The continued increase in frequency of races NA67 and NA76 of *P. graminis* f. sp. *avenae* is the major concern. These races are virulent on the effective stem rust resistance genes *(Pg2, Pg9,* and *Pg13)* deployed in Canadian oat cultivars. Race NA67 is now predominant in the oat stem rust population and race NA76 also is increasing in prevalence. These two races are causing significant yield losses in some oat production areas in the rust region of the prairies. Additionally, the use of susceptible oat cultivars is contributing to the severe losses to stem rust in some commercial fields. Incorporation of genes conferring resistance to NA67 and NA76 is underway in AAFC Cereal Research Centre breeding programs. Identification and characterization of novel oat stem rust resistance also has begun in the stem rust pathology program at the AAFC-Cereal Research Centre.

CROP / CULTURE: Wheat
LOCATION / RÉGION: Manitoba

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TITLE/ TITRE: STRIPE RUST OF WHEAT IN MANITOBA IN 2001

INTRODUCTION AND METHODS: Stripe rust (*P.striiformis* Westend. f. sp. *tritici*), which generally has been very uncommon in Manitoba, was found in wheat fields over a wide geographic area of Manitoba during annual surveys for rust infection conducted in July, August, and September. Leaves infected with stripe rust were collected to determine pathotypic specialization on appropriate host differential lines.

RESULTS AND COMMENTS: Abundant inoculum from the USA along with cool conditions during late June and early July were favorable for stripe rust infection. Stripe rust severity in susceptible wheat fields was mostly at trace levels. Genetic resistance to stripe rust infection is unknown for wheat cultivars recommended for Manitoba. While some cultivars are susceptible, others are thought to be partially resistant due to the presence of the stripe rust resistance gene *Yr18* which is tightly linked to the leaf rust resistance gene *Lr34* present in many current cultivars (Glenlea, CDC Teal, AC Domain, Roblin and others). Infections were most apparent during late June and early July when cool night-time conditions (10-15°C) favored development of stripe rust. Higher temperatures in late July reduced or eliminated further spread and infection of stripe rust and resulted in conversion of uredinia to telia. Late-planted fields had little or no infection due to higher daily temperatures during flag leaf development.

Stripe rust is usually found in the Pacific Northwest and California. Yield losses exceeding 70% in susceptible wheat cultivars due to stripe rust infection have been reported in the Pacific Northwest (Line and Qayoum 1991). Prior to 2000 stripe rust was rare east of the Rocky Mountains. However, in 2000 stripe rust occurred in more than 20 states throughout the US and caused serious yield losses in Washington, California, Texas, Arkansas and Oklahoma (Chen et al. 2002), and was found mostly at trace levels in Manitoba and Saskatchewan (Fetch and McCallum 2001). Twenty-one new races were identified from collections made in the US during 2000 and these may help to explain the epidemics in 2000 and 2001 (Chen et al. 2002). In 2001, stripe rust in the US was more prevalent than in the previous 40 years, and was found in the south central states and later in northern Kansas on susceptible winter wheat crops, resulting in over 7% yield losses in Kansas (Hughes 2001). This inoculum spread north into the Upper Midwestern region of the USA and Manitoba. Prior to 2000 stripe rust was not considered to be a threat to wheat production in Manitoba. It is possible that new variants of stripe rust, with increased virulence and/or potential adaptation to higher temperatures, will result in greater risk of stripe rust infections in this region. The relative susceptibility of the currently registered wheat cultivars is being tested and stripe rust resistance is encouraged for future cultivars to be grown in the rust areas of the Prairies.

REFERENCES:

Chen, X., Moore, M., Milus, E.A., Long, D.L., Line, R.F., Marshall, D., Jackson, L. 2002. Wheat stripe rust epidemics and races of *Puccinia striiformis* f. sp. *tritici* in the United States in 2000. Plant Dis. 86:39-46.

Fetch, T. and McCallum, B. 2001. Stripe rust of wheat in Manitoba and Saskatchewan in 2000. Can. Plant Dis. Surv. 81:88. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Hughes, M. 2001. 2001 Cereal rust bulletin final, August, 2001. (http://www.cdl.umn.edu/crb/2001crb/01crbfin.html)

Line, R. F. and Qayoum, A. 1991. USDA Tech. Bull. 1788.

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Manitoba

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TITLE/ TITRE: 2001 FUSARIUM HEAD BLIGHT SURVEY OF SPRING WHEAT IN MANITOBA

INTRODUCTION AND METHODS: Forty-eight spring wheat fields were surveyed in southern Manitoba for presence of fusarium head blight (FHB) between August 1 and 14, 2001. The incidence (% infected spikes) and severity (% spike diseased) of FHB in each field were assessed by sampling 50 to 100 wheat spikes (plants at average Zadoks growth stage 82) at three locations, and additional spikes were collected for subsequent pathogen identification from kernels. In addition, provincial ag reps sent tissue and/or data from 26 fields from western and northern Manitoba. Up to 30 kernels per field collection were surface-sterilized and incubated on potato dextrose agar under continuous cool white light for 4-5 days to identify the *Fusarium* species present . When more than one *Fusarium* species was present, single spores were grown on carnation leaf agar or synthetic nutrient agar to facilitate identification. The FHB index was calculated as follows: (Mean % incidence X Mean % severity) / 100.

RESULTS AND COMMENTS: The disease was present in 84% of fields. No FHB was seen in fields in more northerly locations including Ste. Rose du Lac, Roblin and Swan River. Severity of FHB was about 9% across Manitoba. The disease was more severe in the Interlake (10.5%) and in southwestern Manitoba (12.2%) than in 2000 (Gilbert et al. 2001). Levels were lowest in central Manitoba (3.6%) for a second year, and moderate in the Red River Valley (6.2%). The predominant pathogen causing FHB was *Fusarium graminearum*, comprising over 90% of isolations from infected kernels (Table 1). Other species found included *F. equiseti*, *F. sporotrichioides*, *F. culmorum*, *F. avenaceum*, and *F. poae*, all at low levels. The majority of fields surveyed were of hard red spring wheat. Based on these results, the outbreak of FHB in spring wheat in 2001 can be described as a moderately severe epidemic and would have caused significant crop damage.

REFERENCES:
Gilbert, J., A. Tekauz, J. Gold, R. Kaethler, E. Mueller, U. Kromer, K. Morgan and A. DiCarlo. 2001. 2000 fusarium head blight survey of spring wheat in Manitoba and eastern Saskatchewan. Can. Plant Dis. Surv. 81:89 (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Table 1. Percent *Fusarium* species isolated from spring wheat in southern Manitoba in 2001.

***FUSARIUM* SPP.**	**PERCENT ISOLATED**
F. graminearum	90.3
F. equiseti	2.7
F. sporotrichioides	1.6
F. culmorum	1.5
F. avenaceum	0.3
F. poae	0.2
Unidentified	3.4

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Manitoba

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TITLE/ TITRE: 2001 SURVEY FOR LEAF SPOT DISEASES OF WHEAT IN MANITOBA

INTRODUCTION AND METHODS: Surveys for leaf spot diseases of hard red spring wheat were conducted in southern Manitoba between August 1 and 14, 2001. Leaves were collected from 41 spring wheat fields between heading and soft dough stages of development. In addition, provincial ag reps sent data and leaf tissue from 26 fields from western and northern Manitoba. Severity of disease on upper and lower leaves was categorized as 0, trace, 1, 2, 3 or 4, with 4 describing dead leaves and 1 lightly affected. Samples of diseased leaf tissue were surface-sterilized and placed in moisture chambers for 5-7 days to promote pathogen sporulation for disease identification.

RESULTS AND COMMENTS: Leaf spot diseases were favoured by the warm wet summer with average severity levels of 3.4 and 2.4 on lower and upper leaves, respectively (including only leaves that were not yet senesced). While *Septoria tritici* symptoms were frequently seen on the flag leaves of mature plants, the most prevalent pathogen identified was *Cochliobolus sativus*, cause of spot blotch. More than twice the normal amount of rain fell in July, and average day and night temperatures in July and August were above normal. *Cochliobolus sativus* thrives under such conditions (Gilbert et al. 1998). Compared to 2000 (Gilbert et al. 2001), prevalence of all pathogens was lower except for *C. sativus*, and percent frequency on leaves was lower for *S. tritici* and *P. tritici-repentis*, but higher for *C.sativus* and *Stagonospora nodorum*.

REFERENCES:
Gilbert, J., S.M. Woods and A. Tekauz. 1998. Relationship between environmental variables and the prevalence and isolation frequency of leaf-spotting pathogens in spring wheat. Can. J. Plant Pathol. 20:158-164.

Gilbert, J., A. Tekauz, J. Gold, R. Kaethler, U. Kromer, K. Morgan, E. Mueller, and A. DiCarlo. 2001. Survey of leaf spot diseases of wheat in Manitoba - 2000. Can. Plant Dis. Surv. 81:90. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Table 1. Prevalence and frequency of leaf spot pathogens in 67 fields of hard red spring wheat in Manitoba in 2001.

	DISEASE / PATHOGEN			
	S. nodorum blotch ***(Stagonospora nodorum)***	**S. tritici blotch** ***(Septoria tritici)***	**Spot blotch** ***(Cochliobolus sativus)***	**Tan spot** ***(Pyrenophora tritici-repentis)***
Fields (%)	52	67	84	59
Frequency (%)	14	27	46	13

CROP / CULTURE: Barley, Oat and Wheat
LOCATION / RÉGION: Manitoba and eastern Saskatchewan

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TITLE/ TITRE: CEREAL VIRUS DISEASE SITUATION IN MANITOBA IN 2001

INTRODUCTION AND METHODS: Virus diseases on cereals in Manitoba monitored in 2001 were barley yellow dwarf (BYD), wheat streak mosaic (WSM) and flame chlorosis (FC).

Collaborators identified and collected samples from early June to late August in cereal crops in Manitoba and parts of eastern Saskatchewan. The proportion of plants with (suspected) virus symptoms in surveyed fields was estimated and specimens with and without symptoms collected for testing. Infection with BYDV and WSMV was confirmed by transmission to indicator hosts, and for BYDV, also characterized as to serotype, by enzyme-linked immunosorbent assay (ELISA). In addition to confirming identity of causal agents, transmission to indicator host plants was used to assess virulence against historical benchmarks. For WSMV, transmission was by mechanical inoculation to a range of susceptible spring bread and durum wheat hosts; for BYDV, transmission was by cereal aphids to sets of seedlings of a susceptible oat host.

RESULTS AND COMMENTS:
Barley Yellow Dwarf (BYD) - As in 2000 (1), losses due to BYD were generally mild. Cereal aphid populations carrying BYDV were not in evidence in Manitoba until late June, which is similar to most years. The proportion of early-arriving cereal aphids that were oat bird-cherry aphid(*Rhopalosiphum padi*), the most efficient vector of the predominant BYDV strain, PAV, was roughly similar to that seen in most years. Although losses were generally mild, sites in southern Manitoba that were seeded extremely late due to delayed drying of fields, showed localized losses in barley and oat. Losses due to BYD in wheat were very small except for high incidences in patches of volunteer winter wheat in some fields in the Red River valley. Consistent with the trend of the last 15-20 years, almost all virus isolates obtained from small grains were of the PAV strain (non-specifically transmitted by the oat bird-cherry aphid).

Wheat Streak Mosaic (WSM) - The increase in winter wheat production in south-central Manitoba appears to be linked to local severe outbreaks of WSM in both spring and winter wheat crops. In an area centred on Crystal City, Manitoba, some level of infection with WSMV was found in every winter wheat field examined; in the most severely affected winter wheat fields, incidence approached 25% and attendant losses would have been about 10%. Neighboring spring wheat fields showed very high incidences, around 50% in the worst affected fields. Losses were greater than in the nearby winter wheat fields due to both higher disease incidences and the fact that spring wheat plants were infected at an earlier, more vulnerable growth stage; losses were as high as 100% in the worst affected portions of fields and about 30% for the whole of these spring wheat fields. In other areas of Manitoba and Saskatchewan where the production of winter wheat predisposes spring wheat to losses from WSM (southern Red River valley, southwestern Manitoba and southeastern Saskatchewan), there were no severe outbreaks and losses in affected fields were estimated to be around 5% (1).

Flame Chlorosis (FC) - After a hiatus in 1999 and two isolated sightings in 2000 (1), FC was again observed in Manitoba in 2001 but at only a single site in a wheat field in the Red River valley south of Winnipeg. However, continuing the trend in the most recent years, no FC was found on barley in

western Manitoba, where historically it has been most frequently observed and caused the greatest losses (2).

REFERENCES:

1. Haber, S. and Kurtz, R. 2001. Cereal virus disease outbreaks in Manitoba in 2000. Can. Pl. Dis. Surv. Dis. 81:71. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

2. Haber, S., D.J.S. Barr & R.G. Platford. 1991. Observations on the distribution of flame chlorosis in Manitoba and its association with certain zoosporic fungi and the intensive cultivation of cereals. Can J. Plant Pathol. 13:241-246.

CROP / CULTURE: Wheat
LOCATION / RÉGION: Manitoba and Saskatchewan

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TITLE/ TITRE: LEAF RUST OF WHEAT IN WESTERN CANADA IN 2001

INTRODUCTION AND METHODS: Nurseries and commercial fields of wheat in Manitoba and eastern Saskatchewan were surveyed for the incidence and severity of leaf rust (*Puccinia triticina* Eriks.) during July and August 2001. Infected leaf samples were collected for pathotype identification by inoculating spores collected from these leaves onto a set of 16 single-gene differential host lines.

RESULTS AND COMMENTS: Wheat leaf rust was first noticed on winter wheat in Manitoba on June 22, which is later than in recent years. Leaf rust development in the Great Plains region of the U.S. was lower than average resulting in less inoculum coming northward into the eastern Canadian prairies. Leaf rust developed slowly due to cool growing conditions until late July. These factors resulted in a wheat leaf rust epidemic during 2001 that was less severe than normal. Field surveys during the first two weeks of August revealed that leaf rust was widespread throughout Manitoba and eastern Saskatchewan. The levels of infection were generally low (trace amounts to 5%) on susceptible cultivars, such as the predominant cultivar AC Barrie. However, leaf rust was more severe (5% to 40% leaf area infected) in an area of southwest Manitoba between Manitou and Killarney. Overall yield loss due to wheat leaf rust in the eastern Prairies would be minimal (< 5%) in 2001. Resistant cultivars such as AC Cora and McKenzie continued to provide good protection against leaf rust infection.

From 286 *P. triticina* isolates tested from Manitoba and Saskatchewan, the predominant pathotypes were TGBJ, MBDS, and THBJ. The frequency of MBDS isolates was lower in this region than in 2000 while the frequencies of TGBJ and THBJ were higher. Both TGBJ and THBJ are virulent on the resistance gene *Lr16* which, along with *Lr13*, conditions resistance in the predominant wheat cultivar in western Canada AC Barrie. MBDS was the predominant pathotype from Alberta. *Puccinia triticina* collections from leaf rust-infected wheat leaves sampled in Ontario, Quebec, and Prince Edward Island were more diverse than the western Canadian collections with PCLR, PBMQ and PCMQ collected most frequently. These pathotypes were not found in western Canada.

CROP / CULTURE: Wheat
LOCATION / RÉGION: Saskatchewan

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TITLE/ TITRE: THREE UNUSUAL DISEASES OF WHEAT IN SASKATCHEWAN IN 2001

INTRODUCTION AND METHODS: As part of a commercial project by the senior author, diseases were monitored on a regular basis between early June and early August in seven crops in east-central Saskatchewan (in Rural Municipalities 216, 246, 276, 336). Of these, two were Canada Western Red Spring wheat (CWRS), three were Canada Prairie Spring wheat (CPS), one was Canada Western Extra Strong wheat (CWES) and one was Canada Western Amber Durum wheat (CWAD).

Additionally, a survey of 133 CWRS and 9 CPS crops was conducted in Crop Districts 1A and 5B in southeast and eastern Saskatchewan. Among the CWRS crops, 44% were AC Barrie, 12% were CDC Teal, and 11% were AC Cadillac. There were 11 other cultivars present at less than a 10% frequency each. Among the CPS crops, 56% were AC Crystal, 33% were AC Vista and 11% were AC Taber. Forty to fifty flag leaves were collected at random at the milk to early dough stages. They were placed in paper envelopes and air-dried at room temperature. Leaf samples were rated for leaf rust and stripe rust severity (percent leaf area covered).

RESULTS AND COMMENTS: The foliar diseases commonly observed before heading on wheat crops in Saskatchewan [tan spot (*Pyrenophora tritici-repentis*) and septoria leaf blotches (*Septoria* spp.)] were at low levels in the seven monitored crops due to dry conditions in the area from May to early July. Similarly, low levels of these diseases were reported thoughout Saskatchewan in another survey (1). Rainfall remained below normal in July, but there were periods of high temperatures and humidity. Leaf rust (*Puccinia recondita*) was visible in several of the seven crops at low levels and fusarium head blight (*Fusarium* spp.) was evident in two CPS crops in late July. However, of more interest was the observation of three diseases that are normally uncommon on wheat in Saskatchewan.

Stripe rust (*Puccinia striiformis*) was found in all seven monitored crops. This disease was also observed on some wheat crops in the same area and at low levels in Manitoba and Alberta in 2000 (3,4, R.A.A. Morrall, unpublished). In 2001, stripe rust in the seven crops was first observed between July 12 and July 24. By early August it was extensively distributed in one CWRS and the three CPS crops at levels that probably caused yield losses. For example, in one late-planted CPS crop, the percent of flag leaves covered by stripe rust lesions was estimated at 10 to 50% in different parts of the field. This is in contrast with a report from Manitoba which indicated that stripe rust was mostly at trace levels in June and July in 2001 (2).

In the survey conducted in crop districts 1B and 5A, leaf rust on the flag leaf was found in 29% of the CWRS wheat crops, and disease severity (percent leaf area covered) was trace to 1% in 23% of the crops, 2-5% in 5% of the crops, and 6-10% in 2% of the crops. For CPS wheat, leaf rust was found in 56% of the crops, with disease severity at trace to 1% in 22% of the crops, 2-5% in 11% of the crops, and 25% in 22% of the crops. Stripe rust appeared to be present at higher frequency and severity than leaf rust. It was found in 41% of the CWRS wheat crops, and disease severity was trace to 1% in 31% of the crops, 2-5% in 8% of the crops, and 6-10% in 3% of the crops. In CPS wheat, stripe rust was present in 67% of the crops with a disease severity of trace to 1% in 44% of the crops, and 2-5% in 22% of the crops.

Powdery mildew (*Blumeria graminis*, syn. *Erysiphe graminis*) appeared on all seven monitored crops by July 18 and became extensive in two fields. This disease is seldom observed in Saskatchewan until late August, and only at trace levels, but the early appearance in 2001 was undoubtedly due to the dry weather.

In the one CWAD crop that was monitored, severe smudge was evident on the harvested grain. Although the crop was slightly damaged by hail in late season, weather conditions were generally not conducive to infection by *Cochliobolus sativus*, *Alternaria* spp., or *Pseudomonas syringae* pv. *atrofaciens*. Similar reports of smudge on durum wheat were common in Saskatchewan in 2001. This seed discoloration might have been caused by heat and drought stress. Black point has been reported to be caused by factors other than pathogen infection (5). About 30 smudged and 30 healthy kernels from the harvested grain were surface disinfected in 2.0% NaOCl for 2 min., then plated on potato dextrose agar and incubated with a photoperiod of 11 hours for 7 days. Eighty-five percent of the smudged kernels produced colonies of *Nigrospora* sp. and a few produced colonies of *A.alternata* or *Fusarium poae*. Seventy percent of the healthy kernels also produced *A.alternata* while the remainder yielded eight other fungal species. It remains unclear whether *Nigrospora* is responsible for the smudge symptoms, or whether it acted as a parasite or as a saprophyte by invading kernels previously damaged by environmental factors.

REFERENCES:

1. Fernandez M.R., Hughes G.R. and Pearse P.G. 2002. Leaf spot diseases of durum wheat in Saskatchewan in 2001 Can. Plant Dis. Survey 82: (this issue). (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

2. Fetch T. and McCallum B. 2002. Stripe rust of wheat in Manitoba and Saskatchewan in 2001. Can. Plant Dis. Survey 82: (this issue). (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

3. Fetch T. and McCallum B. 2001. Stripe rust of wheat in Manitoba and Saskatchewan in 2000. Can. Plant Dis. Survey 81: 88. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

4. Orr D.D., and Turkington T.K. 2001. Cereal disease survey in central Alberta-2000. Can. Plant Dis. Survey 81: 73-74. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

5. Williamson P.M. 1997. Black point of wheat: in vitro production of symptoms, enzymes involved, and association with *Alternaria alternata*. Austral. J. Agric. Res. 48: 13-19.

CROPS / CULTURES: Barley and Wheat
LOCATION / RÉGION: Central Alberta

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TITLE/ TITRE: CEREAL DISEASE SURVEY IN CENTRAL ALBERTA - 2001

INTRODUCTION AND METHODS: A survey of diseases of barley and wheat was conducted August 7 and 8, 2001 in fields randomly selected in Census District 8 (north-central Alberta). This area encompasses Sylvan Lake on the west, Bashaw on the east and is bordered north and south by Ponoka and Innisfail, respectively. Fields were traversed in an inverted V, with visual analysis of 5 plants taking place at 3 locations. Leaf diseases were scored on a 0-9 scale, with a 5 rating equal to one percent of leaf area diseased (1 PLAD) on the upper leaf canopy, 10-25 PLAD on the middle canopy and 25-50 PLAD on the lower-canopy. Common root rot (CRR) was assessed on sub-crown internodes using a 0-4 scale where 1=trace and 4=severe. Other diseases were rated as a percent of the field affected. After the survey was completed, a representative sub-sample of the diseased material collected was cultured in the laboratory for pathogen identification.

RESULTS AND COMMENTS: The results are presented in Table 1. Although central Alberta experienced a drier than normal growing season, resulting in generally lower than normal yields, disease levels were higher than those observed in 2000 (1). Thirty-two barley fields were examined, 21 of which were 2-row and 12 were 6-row barley. Physiological spotting (melanosis) of leaves was common in 2001. Net blotch (*Pyrenophora teres*) and scald (*Rhynchosporium secalis*) were the most commonly observed leaf diseases, with spot blotch (*Cochliobolus sativus*) ranking a distant third. Scald on the heads was noted at trace levels in five 2-row and two 6-row fields. Common root rot (*C. sativus* and *Fusarium* spp.) was less prevalent on 6-row barley than in 2000. Loose smut (*Ustilago nuda*) was more common on 2-row than 6-row crops, as normally found. Ergot (*Claviceps purpurea*) was noted in 3 fields and bacterial blight was uncommon.

Septoria/Stagonospora leaf blotch (*Septoria tritici, Stagonospora nodorum*) was present in all 11 HRS wheat fields, at relatively high levels, while glume blotch (*S. nodorum*) was found in only two fields at low levels. Tan spot (*P. tritici-repentis*) was noted in only two fields and CRR (*C. sativus* and *Fusarium* spp.) only occurred at low levels. Take-all (*Gaeumannomyces graminis*) was observed only at low levels, a reduction from 2000. Stripe rust *(Puccinia striiformis*) was observed at low levels during this survey but became more common later in the season. Ergot (*Claviceps purpurea*) was seen only in one field at a trace level.

REFERENCES:

1. Orr, D.D. and Turkington, T.K. 2001. Cereal disease survey in central Alberta - 2000. Can. Plant Dis. Surv. 81:73-74. (http://res2.agr.ca/london/pmrc)

Table 1. Disease severity and incidence in central Alberta barley and wheat fields in 2001.

	AVERAGE DISEASE RATING/NUMBER OF AFFECTED FIELDS*								
	# Fields	Scald	Net	Melanosis	Spot	CRR	L. Smut	Scald on heads	Ergot	BB
		0	0	0	0	0	%	%	%	%
Barley										
2-row	21	5.4/14	5.2/17	4.2/4	3707 2	1.9/17	tr/7	tr/5	tr/1	tr/1
6-row	12	5.6/8	4.2/9	4.5/4	5.3/3	0.4/9	tr/1	tr/2	tr/2	-

	# Fields	Septoria/ Stagonospora	Glume Blotch	Tan Spot	CRR	Take-all	Powdery Mildew	Leaf Rust	Stripe Rust
		0	%	0	0	%	%	%	%
Wheat									
	11	5.2/11	36951	36923	0.4/9	tr/6	tr/3	tr/1	tr/4

* Abbreviations: tr=trace amounts (<1%); Net=net blotch; Spot=spot blotch; CRR=common root rot; L. smut=loose smut; BB=bacterial blight

CULTURES / CROPS: Avoine *Avena sativa*, Orge *Hordeum vulgare*, Blé *Triticum aestivum*
RÉGION / LOCATION: Québec

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TITRE/ TITLE: LES MALADIES OBSERVÉES CHEZ LES CÉRÉALES EN 2001 AU QUÉBEC

INTRODUCTION ET MÉTHODES: Les essais du réseau d'enregistrement et recommandation des céréales de printemps du Québec ont été visités une à deux fois entre la mi-juillet et la mi-août. Les plantes observées étaient au stade de développement laiteux moyen à pâteux moyen. On y a noté l'incidence des maladies foliaires selon une échelle de 0 à 9 (0=plant sain; 9=feuille étendard présentant des symptômes sur plus de 50 % de sa surface). On a aussi noté les maladies des inflorescences selon une échelle de 0 à 9 (0 = absence de symptôme; 9 = 90 % des épillets atteints par la maladie). Des champs de blé et d'orge situés dans différentes localités au Québec ont aussi été visités afin d'y détecter des problèmes dus aux pourritures racinaires.

RÉSULTATS ET COMMENTAIRES: En 2001 toutes les régions du Québec ont pu bénéficier d'excellentes conditions lors du semis. Par la suite, de la mi-juin à la mi-juillet, les pluies ont été fréquentes et abondantes. Cette période pluvieuse a été suivie d'une période de sécheresse et de chaleur dans le centre et le sud-ouest du Québec. Pour cette dernière région, on n'a relevé aucune précipitation entre le 15 juillet et le 20 août. La situation était tout à fait différente dans la région du Saguenay-Lac-Saint-Jean qui a reçu des averses de pluie presque tous les jours, pendant cette période.

Les pluies fréquentes coïncidant avec les stades d'épiaison et de floraison des céréales ont été très propices aux infections des inflorescences par *Fusarium* spp. (*Fusarium graminearum* principalement). Le temps sec qui a suivi a, heureusement, limité l'expansion de la maladie dans les régions du sud du Québec. L'Estrie et le Saguenay-Lac-Saint-Jean ont été les régions les plus touchées par la fusariose (La Financière, comm. pers.). À Hébertville, au Lac-Saint-Jean, les lignées de blé les plus sensibles avaient un pourcentage d'épillets fusariés de plus de 20 %; chez l'orge les lignées les plus affectées avaient jusqu'à 15 % de leurs épillets fusariés; même l'avoine, une espèce considérée peu sensible, montrait des symptômes.

Chez l'avoine, la maladie foliaire la plus fréquente a été, encore en 2001, la tache ovoïde (*Stagonospora avenae*). L'intensité des symptômes a été moyenne dans toutes les régions. La rouille couronnée (*Puccinica coronata*), observée aux deux stations habituelles, avait une incidence moyenne à Sainte-Anne-de-Bellevue et faible à La Pocatière. Le virus de la jaunisse nanisante de l'orge (VJNO) a été quasi absent en 2001.

Chez le blé, les taches foliaires causées par *Drechslera tritici-repentis* et par *Stagonospora nodorum*, étaient encore au rendez-vous partout au Québec avec une incidence moyenne. À Lennoxville et à Princeville, *S. nodorum*, s'est même retrouvé sur les épis causant la tache des glumes. L'oïdium (*Blumeria graminis*, syn. *Erysiphe graminis*) a été peu présent, sauf à Princeville où l'intensité des symptômes était assez élevée. La rouille des feuilles (*Puccinia recondita*) et le VJNO, quant à eux, ne se sont pratiquement pas manifestés. Des pertes dues aux pourritures racinaires (*Pythium* spp. surtout) ont été observées dans le centre du Québec et la région de Québec.

Chez l'orge, le fait marquant de 2001 en ce qui concerne les maladies foliaires a été la présence de la rhynchosporiose (*Rhynchosporium secalis*) dans toutes les régions du Québec. Les symptômes étaient cependant plus intenses à Princeville et à Hébertville et Normandin, Lac Saint-Jean. La rayure réticulée (*Drechslera teres*) a été, comme à l'habitude, observée partout au Québec. La rouille des feuilles (*Puccinia hordei*) et le VJNO ont été, comme chez le blé, très peu présents. L'oïdium a été observé à La Pocatière seulement, avec un niveau d'infection allant de modéré à élevé dépendamment des lignées. Le centre du Québec et la région de Québec ont été touchés, tout comme chez le blé, par des pourritures racinaires (*Pythium* spp. principalement). Dans plusieurs champs, spécialement des sols lourds et mal oxygénés, on a trouvé des plages assez larges où les pertes dépassaient le 50 %. En fin de saison, alors que les plantes subissaient un déficit hydrique, les pourritures racinaires observées étaient surtout associées aux *Fusarium* spp. et *Bipolaris* sp.

CROP / CULTURE: Barley
LOCATION / RÉGION: Manitoba

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TITLE/ TITRE: 2001 SURVEY FOR LEAF SPOT DISEASES OF BARLEY IN MANITOBA

INTRODUCTION AND METHODS: Foliar diseases of barley in southern Manitoba were assessed by surveying 45 farm fields (18 two-row, 27six-row) from July 27 to August 16 when most crops were at the milky to soft dough stage of growth (ZGS 73-88). Fields were sampled at regular intervals along the survey routes, depending on availability. Five of the fields were scouted by Manitoba Agriculture and Food 'ag reps' and samples submitted. Disease incidence and severity were recorded by averaging their occurrence on approximately 10 plants along a diamond-shaped transect of about 30 m per side, beginning near the field edge. Disease ratings were taken on both the upper (flag and penultimate leaves) and lower leaf canopies, using a six-category scale: 0 or nil (no visible symptoms); trace (<1% leaf area affected); very slight (1-5%); slight (6-15%); moderate (16-40%); and severe (41-100%). Infected leaves with typical symptoms were collected at each site, placed in paper envelopes and allowed to dry. Surface-sterilized pieces of infected leaf tissue were placed in moist chambers for 3-5 days to identify the causal agent(s) and their relative frequencies.

RESULTS AND COMMENTS: Conditions in Manitoba in 2001 were generally cool and moist in May and June, then turned hot in July and August, with little rain in the latter month. As noted in previous reports, the field history, i.e., presence or absence of barley stubble from the previous year, appeared to have the most influence on the level of leaf spotting observed.

Leaf spots were observed in the upper and/or lower leaf canopies of all barley fields surveyed. Disease levels in the upper canopy were nil, trace or very slight in 31% of fields, slight in 33%, moderate in 16%, severe in 13%, and leaves were senescent in 7%. Respective severity categories in the lower canopy were tabulated as 4%, 31%, 11%, 18% and 37%. On the basis of these results, average grain yield losses in barley from leaf spots were relatively low, likely in the range of 3-5%.

Cochliobolus sativus and *Pyrenophora teres*, causal agents of spot blotch and net blotch, respectively, were most frequently identified in infected leaf tissue, and were responsible for most of the leaf spotting recorded (Table 1). In comparison to 2000, damage resulting from *C. sativus* increased significantly in 2001 while that from *P. teres* was reduced by half (Tekauz et al. 2001). *Septoria passerinii* (speckled leaf blotch) and *Stagonospora nodorum* (stagonospora nodorum blotch) were identified in only a few fields and kernels, and would have had minimal impact. *Rhynchosporium secalis* (scald) was not detected in 2001.

While results of the survey indicated that *C. sativus* (spot blotch) was more dominant in 2001 than in previous years, in late August, several late-planted crops of barley with extremely high levels of leaf spotting (near 100% disease-induced necrosis of leaf tissue) were observed, and subsequent isolations indicated that all damage resulted from spot blotch. In such fields, heads were often poorly filled suggesting that high grain yield losses (estimated at 30-40%) occurred. The level of leaf spotting in these barley fields was the most uniformly severe seen in memory. The high temperatures in July and August would have favoured development of spot blotch, which,combined with late seeding, a susceptible host, and an aggressive pathogen, led to wholesale and apparently rapid destruction of photosynthetic leaf tissue.

REFERENCES:

Tekauz, A., J. Gilbert, J. Gold, E. Mueller, M. Idris, M. Stulzer, M. Beyene and R. Kaethler. 2001. Survey for leaf spot diseases of barley in Manitoba in 2000. Can. Plant Dis. Surv. 81: 63-64. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Table 1. Prevalence and isolation frequency of leaf spot pathogens of barley in Manitoba in 2001

PATHOGEN	PREVALENCE (% OF FIELDS)	DAMAGE (% OF ISOLATIONS)
Pyrenophora teres	62.2	28.4
Cochliobolus sativus	88.9	68.6
Septoria passerinii	6.7	2.0
Stagonospora nodorum	4.4	0.9

CROP / CULTURE: Barley
LOCATION / RÉGION: Manitoba

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TITLE/ TITRE: FUSARIUM HEAD BLIGHT OF BARLEY IN MANITOBA IN 2001

INTRODUCTION AND METHODS: A total of 38 barley fields (15 two-row, 23 six-row) in southern Manitoba were surveyed for the presence of fusarium head blight (FHB) between July 27 and August 16, 2001. The fields were selected randomly along the survey routes; one sample was submitted by a provincial ag rep. FHB incidence (the percentage of heads with typical symptoms) in each field was assessed by sampling 80–100 spikes at 3 locations for disease. FHB severity (the average affected percentage of symptomatic heads) was estimated visually in the field. Several heads with FHB symptoms were collected at each field site and stored in paper envelopes. A total of 50 discoloured and putatively infected kernels, or those of normal appearance to make up the remainder, were removed from five heads per location. The kernels were surface sterilized in 0.3% NaOCl and plated onto potato dextrose agar to quantify and identify *Fusarium* spp. in the seed.

RESULTS AND COMMENTS: Conditions initially (May and June were cool and moist in southern Manitoba in 2001, then became hot in July and August, with little precipitation in the latter month. As such, conditions for *Fusarium* inoculum production on over wintered stubble, and for initial infection of cereal spikes were moderately favourable, and this subsequently led to widespread and sometimes severe development of FHB. Visually, FHB was more distinct in barley in 2001 than in previous years (since 1994.)

Fusarium head blight was found in all 38 fields surveyed. Average incidence of FHB in two-row crops was 34% (range 6 - 82%), while severity averaged 12% (range 1 - 50%); in six-row crops incidence was 43% (range 4 - 93%) and severity 10% (range 1 - 28%). The resulting average FHB Index (incidence X severity)/ 100 for 2-row barley was 5.8%, and that for 6-row barley 5.0%; for all barley this was 5.3% (range of 0.4 to 40%). This would have resulted in an estimated yield loss from FHB of about 2%. The higher FHB Index for 2-row barley vs. 6-row was unusual, as this class normally has been less affected by FHB than the 6-row crop.

The Fusarium species isolated from kernels are shown in Table 1. As in the past several years, *F. graminearum* was the predominant pathogenic species. However, *F. poae* also was detected in most fields, and was isolated from kernels at a higher frequency than in the past few years (Tekauz et al. 2001, McCallum et al. 2000).

REFERENCES:

Tekauz, A., Gilbert, J., Gold, J., Mueller, E., Idris, M., Stulzer, M., Beyene, M. and Nedohin, E. 2001. Fusarium head blight of barley in Manitoba and eastern Saskatchewan in 2000. Can. Plant Dis. Surv. 81: 65. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

McCallum, B., Tekauz, A., Gilbert, J., Gold, J., Idris, M., Mueller, E., Kaethler, R., Stulzer, M. and Kromer, U. 2000. Fusarium head blight of barley in Manitoba in 1999. Can. Plant Dis. Surv. 80: 36. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Table 1. *Fusarium* spp. isolated from barley kernels in Manitoba in 2001.

FUSARIUM SPP.	PERCENT OF FIELDS	PERCENT OF KERNELS
F. graminearum	95.3	73.3
F. poae	79.1	19.3
F. sporotrichioides	44.2	3.1
F. avenaceum	34.9	3.5
F. equiseti	9.3	0.7
F. culmorum	2.3	0.1

CROP / CULTURE: Winter Wheat
LOCATION / RÉGION: Manitoba

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TITLE/ TITRE: FUSARIUM HEAD BLIGHT OF WINTER WHEAT IN MANITOBA IN 2001

INTRODUCTION AND METHODS: The occurrence of fusarium head blight (FHB) in winter wheat in southern Manitoba was assessed by surveying 45 farm fields from July 19 to 27. Because winter wheat is not widely grown in Manitoba (in 2001 it was planted on about 2% of the total wheat acreage - Manitoba Crop Insurance Corp.) the fields were not surveyed at random; rather, their location was specified by Manitoba Agriculture extension personnel and/or by producers. Fusarium head blight in each field was assessed by non-destructive sampling of a minimum of 80-100 plants at each of 3 locations for percentage of infected spikes (disease incidence), and for the average percentage of the head affected (severity). Disease levels were calculated as the 'FHB Index' (% incidence x % severity) / 100. Several affected heads were collected from each location; subsequently, 50 seeds from blighted portions of heads were surface-sterilized in 0.3% NaOCl for 3 min., air-dried, and plated onto potato dextrose agar to identify and quantify the *Fusarium* spp. present.

RESULTS AND COMMENTS: Conditions initially (April, May, June) were moist but quite cool, and only moderately favourable for development of FHB. July and August were uniformly hot with little rain in the latter month. Winter wheat normally flowers earlier (early to mid-July) than spring-seeded crops, and because of this seems to escape FHB infection in some years. Despite apparently adequate moisture when winter wheat headed/flowered in 2001, levels of FHB in the crop were relatively low. Possibly, inoculum was not yet abundant due to the prior cool conditions.

Forty-four of the 45 fields surveyed had plants with visible symptoms of FHB. Overall, incidence of FHB was 6.1% (range 0 - 35%), severity, 39.5% (range 0 - 100%) and the FHB Index, 1.8% (range 0 - 9%). As such, FHB was estimated to have caused yield losses in commercial winter wheat of 1- 1.5%. Losses in Manitoba in 2001 were therefore low and the crop 'escaped' FHB, as has been the case for the past few years, except in 1998.

The *Fusarium* spp. found and their levels on seed are listed in Table 1. As has been the case for all wheat grown in Manitoba, *F. graminearum* was the principal pathogen causing FHB. However, the level of other *Fusarium* species were higher on winter wheat in 2001 than in 2000 (Tekauz et al. 2001).

REFERENCES:
Tekauz, A., J. Gold, J. Gilbert, E. Mueller, M. Idris, M. Stulzer, M. Beyene, E. Nedohin and B. Geoffroy. 2001. Fusarium head blight in winter wheat in Manitoba in 2000. Can. Plant Dis. Surv. 81: 96-97. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Table 1. *Fusarium* spp. isolated from Manitoba winter wheat kernels in 2001.

FUSARIUM SPP.	PERCENT OF FIELDS	PERCENT OF KERNELS
F. graminearum	97.0	89.2
F. avenaceum	35.6	2.9
F. poae	31.1	2.6
F. sporotrichioides	26.7	3.7
F. equiseti	15.6	0.9
F. culmorum	2.2	0.7

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba

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TITLE/ TITRE: OAT LEAF SPOT DISEASES IN MANITOBA IN 2001

INTRODUCTION AND METHODS: A limited survey for foliar diseases of oat in Manitoba was conducted on July 27 by sampling eight southern Red River Valley fields when plants were between heading and soft dough stages of growth. A further three collections of oat leaves were obtained from the St. Rose du Lac region (west-central MB) and Portage la Prairie region (south-central MB) via provincial ag reps. Disease severity was estimated on plants along a diamond-shaped transect of about 30 m per side, beginning near the field edge. Disease ratings were taken on both the upper and lower leaf canopies, using a six-category scale: 0 or nil (no visible symptoms); trace (<1% leaf area affected); very slight (1-5%); slight (6-15%); moderate (16-40%); and severe (41-100%). Infected leaves with typical symptoms were collected at each site and stored in paper envelopes. Surface-sterilized pieces of infected leaf tissue were placed in moisture chambers for 4-7 days to identify the causal pathogen(s) and their frequency, and to deduce the disease(s) present.

RESULTS AND COMMENTS: Conditions in Manitoba in 2001 were generally cool and moist in the earlier part of the growing season (May, June) and then became hot in July and August and somewhat drier in the latter month.

Leaf spots were observed in the upper and/or lower leaf canopies of 8 of 11 oat fields surveyed. Disease levels in the upper canopy were nil, trace or very slight in 18% of fields, slight in 27%, moderate in 18%, severe in 9%, and leaves were senescent in 27%. Leaves in the lower canopies of all fields were already senescent. Based on disease development in the upper canopy (63% of fields with nil to moderate leaf spotting), foliar diseases of oat caused little damage in 2001, likely a yield loss of <2%.

Cochliobolus sativus (spot blotch), *Stagonospora avenae* (stagonospora avenae blotch) and *Pyrenophora avenae* (leaf spot) were isolated from infected tissues (Table 1). Based on isolation frequency, most leaf spotting in oat was the result of spot blotch and stagonospora avenae blotch.

Table 1. Prevalence and isolation frequency of leaf spot pathogens of oat in Manitoba in 2001.

PATHOGEN	PREVALENCE (% OF FIELDS)	DAMAGE (% OF ISOLATIONS)
Cochliobolus sativus	75.0	48.4
Stagonospora avenae	75.0	46.2
Pyrenophora avenae	62.5	5.4

CROP / CULTURE: Winter wheat
LOCATION / RÉGION: Manitoba

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TITLE/ TITRE: 2001 SURVEY FOR LEAF SPOTS OF WINTER WHEAT IN MANITOBA

INTRODUCTION AND METHODS: Foliar diseases of winter wheat in Manitoba were assessed by surveying 45 farm fields from July 19 to 27 when crops were at the early milk to soft dough stage (ZGS 77-87). Because winter wheat occupies a small acreage in Manitoba (in 2001 it was planted on about 2% of the total wheat acreage - Manitoba Crop Insurance Corp.) the farm fields were not surveyed at random; rather, their location was specified by Manitoba Agriculture extension personnel and producers. The fields surveyed were located in southern Manitoba, in the area bounded by Hwy #16 and the US border, Virden in the west and Steinbach to the east. Disease severity was estimated on approximately 10 plants along a diamond-shaped transect of about 30 m per side, beginning near the field edge. Disease ratings were taken on both the upper (usually the flag leaf) and lower leaf canopies, using a six-category scale: 0 or nil (no visible symptoms); trace (<1% leaf area affected); very slight (1-5%); slight (6-15%); moderate (16-40%); and severe (41-100%). Infected leaves with typical symptoms were collected at each site and stored in paper envelopes. Surface-sterilized pieces of infected leaf tissue were placed in moisture chambers for 4-7 days to identify the causal pathogen(s), their frequency, and to deduce the disease(s) present.

RESULTS AND COMMENTS: Conditions in Manitoba in 2001 were generally cool and moist in the early to mid-part of the growing season (April, May, June) and then became hot and somewhat drier.

Leaf spots were observed in the upper and/or lower leaf canopies of all 45 winter wheat fields surveyed. Disease levels in the upper canopy were nil, trace or very slight in 0% of fields, slight in 40%, moderate in 27%, severe in 9%, and leaves were senescent in 24%. Respective severity categories in the lower canopy were tabulated as 0%, 4%, 2%, 0% and 93%. Based on disease development in the upper canopy (40% of fields slight, 36% with moderate to severe leaf spotting), foliar diseases in winter wheat in 2001 caused some damage, likely a yield loss near 5%. This is more damage than observed in 2000 (Tekauz et al. 2001).

Tan spot, caused by *Pyrenophora tritici-repentis*, was the most prevalent disease and occurred at much higher levels than in 2000 (Table 1). *Septoria tritici* was not identified in infected leaf tissue in 2001. Spot blotch, caused by *Cochliobolus sativus* appeared to cause considerably less damage in 2001 than 2000, while the total 'septoria' leaf blotches were of similar prevalence as in 2000 (Tekauz et al. 2001).

REFERENCES:
Tekauz, A., J. Gold, J. Gilbert, E. Mueller, M. Idris, M. Stulzer, M. Beyene and B. Geoffroy. 2001. Leaf spots of winter wheat in Manitoba in 2000. Can. Plant Dis. Surv. 81: 100-101. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Table 1. Prevalence and isolation frequency of leaf spot pathogens of winter wheat in Manitoba in 2001

PATHOGEN	PREVALENCE (% OF FIELDS)	DAMAGE (% OF ISOLATIONS)
Pyrenophora tritici-repentis	60.0	62.6
Cochliobolus sativus	24.4	16.8
Stagonospora nodorum	22.2	15.0
Septoria avenae f.sp. *triticea*	8.9	5.6

CROP / CULTURE: Barley
LOCATION / RÉGION: Eastern Ontario

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TITLE/ TITRE: FOLIAR DISEASES OF BARLEY IN ONTARIO IN 2001

INTRODUCTION AND METHODS: A survey for foliar diseases of barley was conducted in 22 fields in the second and third weeks of July when plants were at the milk to soft dough stages of development. The fields surveyed were chosen at random from regions in eastern Ontario, where most of the spring barley in the province is grown. Severity of diseases was determined by rating 10 flag and penultimate leaves, sampled at each of three random sites per field using a rating scale of 0 (no disease) to 9 (severely diseased). Diseases were identified by visual symptoms. Average severity scores <1, <3, <6, and >6 were considered as trace, slight, moderate, and severe levels of infection, respectively. In addition, incidence of barley stripe, covered smut, ergot, and loose smut, was estimated as a percentage of plants infected, when these diseases were found.

RESULTS AND COMMENTS: A total of nine diseases or disease complexes were observed in the 22 fields surveyed (Table 1). Of these, net blotch (*Pyrenophora teres*) was the most prevalent, and was observed in 15 fields. The mean severity for net blotch was 4.6 on the 0-9 scale. Severe net blotch infection was observed in six fields (disease scores >6.0). These severely infected fields were located at or near Green Valley, Inkerman, Williamsburg, Vankleek Hill, Forthton, and Carleton Place.

Spot blotch (*Cochliobolus sativus*) was the second most prevalent disease and was observed in 11 fields at a mean severity of 2.7. Moderate infection by spot blotch was observed in four fields; no severe infection was found. The disease did not appear to cause significant damage.

The septoria complex, including speckled leaf blotch caused by *Septoria avenae* f. sp. *triticea*, leaf blotch by *S. passerinii*, and glume blotch by *S. nodorum*, was observed in five fields at a mean severity of 2.0. Moderate infection by the septoria complex was observed in one field; no severe infection was found. The disease appeared to cause little damage to infected crops.

Leaf rust (*Puccinia hordei*) and powdery mildew (*Erysiphe graminis* f.sp. *hordei*) each were observed in 2 fields, at mean severities of 3.2 and 2.0, respectively. Severe infection by these diseases was not observed. These diseases appeared to be of minor importance in 2001.

Barley leaf stripe (*Pyrenophora graminea*), covered smut (*Ustilago hordei*), ergot (*Claviceps purpurea*), loose smut and/or false loose smut (*Ustilago nuda* and *U. nigra*) were observed in 2, 1, 3, and 3 fields, respectively, at incidence levels of 3.3-6.7%, 1.0%, 0.2-0.5% and 0.2-1.0%, respectively. These diseases likely resulted in minimal yield reductions.

Although there have been no systematic surveys for barley foliar diseases conducted in Ontario in the past decade, the overall disease severity was considered low in 2001, due to the hot and dry conditions prevailing throughout June and July. However, yield potential also was expected to be lower than average in 2001 in Ontario. Several of the fields surveyed were severely affected by heat and drought stress, as evidenced by plant stunting, premature leaf senescence, and floret abortion.

ACKNOWLEDGMENT: Technical assistance was provided by Y. Chen, and F. Sabo.

Table 1. Incidence and severity of foliar and other diseases in 22 fields of barley in eastern Ontario in 2001.

DISEASE	NO. FIELDS AFFECTED	DISEASE SEVERITY/INCIDENCE IN AFFECTED FIELDS*	
		Mean	Range
Leaf rust	2	3.2	3.1-3.3
Net blotch	15	4.6	1.2-8.7
Powdery mildew	1	2.0	2.0
Septoria complex	5	2.0	0.6-5.8
Spot blotch	11	2.7	0.8-4.9
Barley stripe	2	5.0	3.3-6.7
Covered smut(%)	1	1.0	1.0
Ergot (%)	3	0.4	0.2-0.5
Loose smut (%)	3	0.4	0.2-1.0

*Foliar disease severity rated on a scale of 0 (no disease) to 9 (severely diseased); for barley stripe, covered smut, ergot and loose smut, incidence was rated as percent plants infected.

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Eastern Ontario

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TITLE/ TITRE: FUSARIUM HEAD BLIGHT OF SPRING WHEAT IN EASTERN ONTARIO IN 2001

INTRODUCTION AND METHODS: A disease survey for the presence of fusarium head blight (FHB) in spring wheat was conducted in the second and third weeks of July when plants were at the soft dough stage of development. The 26 wheat fields surveyed were chosen at random in regions of eastern Ontario where most of the spring wheat in the province is grown. FHB was estimated for both incidence (percent infected spikes) and severity (0-9), for a plant population of approximately 200 spikes at each of three random sites per field. The 0-9 scale for severity, developed for plot assessments, indicates: 0 = no visible symptoms, 1 = majority of infected spikes have 1 diseased spikelet, 2 = majority have 2 diseased spikelets, 3 = majority have 3 diseased spikelets, 4 = majority have more than 3 diseased spikelets, but <1/4 spike area with symptoms (SAS), 5 = majority have <1/3 SAS, no faded (wilting) spikelets above infection sites, 6 = majority have <1/2 SAS, a few faded spikelets above infection sites, 7 = majority have <2/3 SAS, all spikelets faded above infection sites, no peduncle discoloration, 8 = majority have <3/4 SAS, all spikelets faded above infection sites and few faded spikelets below infection sites, restricted peduncle discoloration, and 9 = Majority of infected spikes have >3/4 SAS, all spikelets faded and extended peduncle discoloration, spike dead. Overall disease levels were calculated as the 'FHB intensity' (0-100), using the formula FHB intensity = (incidence x severity)/9*100. Intensity values of $\leq$1, $\leq$10, $\leq$20, and >20 were considered slight, moderate, severe, and very severe infection, respectively.

To determine the occurrence and relative prevalence of *Fusarium* species, 10 infected heads were collected at random from each field and hand threshed after air-drying at room temperature. Ten discolored kernels from each field collection were selected and subsequently surface sterilized in 1% NaOCl for 30 sec. and plated onto potato dextrose agar with 100 ppm streptomycine sulfate added, in 9-cm petri dishes. Plates were incubated at 22-25°C, with 14-hour illumination from Fluorescent and long wave ultraviolet lamps for 14 days. *Fusarium* species developing from kernels were identified by microscopic examination of conidia for size and morphology, and/or by other diagnostic characteristics.

RESULTS AND COMMENTS: Fusarium head blight was observed in all 26 fields surveyed (Table 1). Incidence ranged from 0.6-63.3%, with a mean of 16.9%. Severity ranged from 1 to 8, with a mean of 5.2, on the 0-9 scale. The FHB intensity ranged from 0.1 - 54.0, with a mean of 12.4%. Slight, moderate, severe, and very severe infections of FHB were observed for 7, 6, 9, and 4 fields, respectively. The most severely affected fields (FHB intensity >20) were located at or near Alfred, L'Orignal, and Winchester (2 fields).

Six *Fusarium* species were isolated from infected kernels (Table 2). *Fusarium graminearum* was the predominant species, occurring in 96.2% of fields and on 67.1% of infected kernels. *Fusarium sporotrichioides* and *F. crookwellense* were the second and third most frequently isolated, occurring in 19.2% and 15.4% of fields and on 3.5% and 1.9% of infected kernels, respectively. the species *F. avenaceum, F. culmorum* and *F. poae,* were found infrequently, each from one field and 0.4% of infected kernels.

There have been no systematic surveys for FHB in spring wheat conducted in Ontario in the past decade. Although 50% of the surveyed fields were classified to have severe or very severe FHB

infection, the overall severity was considered lower in 2001 than in 2000 (Dr. W.L. Seaman, personal communication). This may have been due to the hot and dry conditions in June and July when wheat would have headed and flowered. The lower of FHB disease severity in 2001 will likely result in better, wheat quality and economical return to Ontario wheat producers than experienced in 2000.

Table 1. Occurrence of fusarium head blight in 26 fields of spring wheat in eastern Ontario in 2001.

FIELD LOCATION	INCIDENCE (%)	SEVERITY (0-9)	INTENSITY (0-100)*
Alfred	63.3	7.7	54
Antrim	0.5	5.7	0.3
Ashton	0.5	1.0	0.1
Caledonia Springs	21.7	4.3	10.4
Carleton Place	0.5	3.7	0.2
Curran	28.3	5.7	17.8
Dalkeith	15	6.0	10
Dwyer Hill	8.5	4.0	3.8
Finch	0.5	2.0	0.1
Fournier	15.8	6.0	10.6
Green Valley	0.5	2.7	0.1
Inkerman	25	6.0	16.7
Kemptville, 5 km N	3.7	4.0	1.6
Kemptville	7.5	5.3	4.4
Kemptville	0.5	4.3	0.2
L'Original	55	8.0	48.9
Nepean	3	5.0	1.7
Nepean, 10 km SE	3	4.0	1.3
Richmond	28.3	5.7	17.8
St. Isidore de Prescott	25	6.0	16.7
Vankleek Hill	6	5.0	3.3
Vernon	18.3	7.7	15.6
Williamsburg	0.5	2.7	0.1
Winchester, 5 km SW	45	6.0	30.0
Winchester	48.3	7.7	41.2
Winchester, 10 km N	15.8	8.0	14.1
Mean	16.9	5.2	12.4
Range	0.5-63.3	1.0-8.0	0.1-54.0

*FHB intensity = (incidence x severity)/9*100.

Table 2. Frequency of *Fusarium* species isolated from spring wheat in eastern Ontario in 2001.

FUSARIUM	% FIELDS	% KERNEL INFECTION
F. avenaceum	3.8	0.4
F. crookwellense	15.4	1.9
F. culmorum	3.8	0.4
F. culmorum	96.2	67.1
F. poae	3.8	0.4
F. sporotrichioides	19.2	3.5

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Eastern Ontario

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TITLE/ TITRE: FOLIAR DISEASES OF SPRING WHEAT IN ONTARIO IN 2001

INTRODUCTION AND METHODS: A survey for foliar diseases of spring wheat was conducted in 26 fields in the second and third weeks of July when plants were at the milk to soft dough stages of development. The fields surveyed were chosen at random from regions in eastern Ontario, where most of the spring wheat is grown. Severity of diseases was determined by rating 10 flag and penultimate leaves sampled at each of three random sites for each field using a rating scale of 0 (no disease) to 9 (severely diseased). Diseases were identified by visual symptoms. Average severity scores <1, <3, <6, and >6 were considered trace, slight, moderate, and severe infection, respectively. In addition to foliar diseases, incidence of loose smut, ergot and take-all was estimated as a percentage of plants infected, when these diseases were found.

RESULTS AND COMMENTS: A total of 10 diseases were observed in the 26 fields surveyed (Table 1). Of these, leaf rust (*Puccinia triticina*) was the most prevalent, and was observed in 18 of the 26 fields surveyed. The mean disease severity was 3.2 on the 0-9 scale. Severe infection by leaf rust was observed in four fields. The severely infected fields were located at or near Alfred, St. Isidore, Fournier, and Curran.

Tan spot (*Pyrenophora tritici-repentis*) and septoria leaf blotch (*Septoria* spp.) were observed in 11 and 9 fields, respectively, at mean severities of 1.3 and 1.5. No severe infection by either disease was observed. These diseases did not appear to have caused significant damage.

Powdery mildew (*Erysiphe graminis* f. sp. *tritici*) and spot blotch (*Cochliobolus sativus*) each were observed in three fields, at mean severities of 5.1 and 3.1, respectively. Although the two diseases were less frequently observed than tan spot or septoria leaf blotch, their average severities were greater. They appear to have the potential to damage infected crops.

Other foliar diseases observed included bacterial leaf blight (*Pseudomonas syringae* pv. *syringae*) and septoria glume blotch (*Septoria* spp.). Each was observed at low levels in only one field; they appeared to be of minor importance.

Ergot (*Claviceps purpurea*), loose smut (*Ustilago tritici*), and take-all (*Gaeumannomyces graminis* var. *tritici*) were observed in 6, 4, and 4 fields, respectively and incidence ranged from 0.2-0.5%, 0.2-0.5%, and 0.2-1.0%, respectively. At these levels, they likely did not cause any appreciable reductions in yield.

Although there have been no systematic surveys for foliar diseases in spring wheat conducted in Ontario in the past decade, overall disease severity was considered low in 2001, due to the hot and dry conditions prevailing throughout June and July. Several fields surveyed showed plant stunting and premature leaf senescence as a result of the heat and drought stress.

ACKNOWLEDGMENT: Technical assistance was provided by Y. Chen, and F. Sabo.

Table 1. Incidence and severity of foliar and other diseases in 26 fields of spring wheat in eastern Ontario in 2001.

DISEASE	NO. FIELDS AFFECTED	DISEASE SEVERITY/INCIDENCE IN AFFECTED FIELDS*	
		Mean	Range
Bacterial leaf blight	1	1.4	1.4
Leaf rust	18	3.2	0.5-7.8
Powdery mildew	3	5.1	4.3-5.9
Septoria glume blotch	1	1.6	1.6
Septoria leaf blotch	9	1.5	0.5-3.0
Spot blotch	3	3.1	2.3-4.4
Tan spot	11	1.3	0.2-4.3
Ergot (%)	4	0.4	0.2-0.5
Loose smut (%)	6	0.3	0.2-0.5
Take-all (%)	4	0.5	0.2-1.0

*Foliar disease severity was rated on a scale of 0 (no disease) to 9 (severely diseased); for ergot, loose smut and take-all, incidence was rated as percent plants infected.

CROP / CULTURE: Corn
LOCATION / RÉGION: Ontario and Quebec

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TITLE/ TITRE: SURVEY OF CORN PESTS IN ONTARIO AND QUEBEC IN 2001

INTRODUCTION AND METHODS: From September 11 to September 26, 2001, the Eastern Cereal and Oilseed Research Centre (ECORC) conducted a corn pest survey in Ontario and Quebec. As in previous surveys (1, 2), the main purpose was to determine the distribution of the bacterial disease Stewart's wilt (*Pantoea stewartii = Erwinia stewartii*) and of viral diseases, such as maize dwarf mosaic (MDM), sugarcane mosaic (SCM), and wheat streak mosaic (WSM). Also recorded were the distribution and severity of other diseases and insects including eyespot (*Aureobasidium zeae*), northern leaf blight (*Exserohilum turcicum*), common rust (*Puccinia sorghi*), common smut (*Ustilago maydis*), head smut (*Sporisorium holci-sorghi = Sphacelotheca reiliana*), stalk rot (*Fusarium spp.*, and *Colletotrichum graminicola*), ear rot (*Fusarium spp.*), European corn borer (*Ostrinia nubilalis*) and corn rootworm (*Diabrotica longicornis* and/or *D. virgifera*). As well, scouting for any new diseases in Canada was conducted, especially for grey leaf spot (*Cercospora zeae-maydis*).

At each of 118 field locations visited, the incidence of each pest and the severity of the predominant pest were recorded. At the same time, Stewart's wilt samples and leaves with virus-like symptoms were collected. ELISA tests for Stewart's wilt were done in the laboratory by using reagent sets, protocols, and antibodies provided by AGDIA Inc. (Elkhart, Indiana 46514, USA). Viral samples were send to AGDIA Inc. for identification.

RESULTS AND COMMENTS:
Fungal leaf diseases: In contrast to the widespread high levels of common rust that occurred in 2000 (2), only low levels were found in 2001 at most locations (Table 1) and only a few commercial grain hybrids and sweet corn cultivars exhibited moderate susceptibility. Eyespot was found at 69 locations and as for rust, only a few hybrids were found to be moderately susceptible. Northern leaf blight was found at only 14 locations, at levels that would not have resulted in significant yield losses. We have been monitoring blight incidence and severity at two farms which previously had severe outbreaks. One of these farms in Forfar, Leeds and Grenville County, ON, had only few blight lesions despite a severe yield loss due to blight in 2000 and residue still on the soil surface in 2001. No blight was found at a second farm in St-Philippe, Argenteuil County, QC, which had severe northern leaf blight in 1998, less in 1999 and no blight in 2000.

Typical symptoms of grey leaf spot were found in nine fields: six in the Chatham-Kent area and one in each of Dufferin, Peel, and Wellington counties in Southern Ontario. From leaf samples, the pathogen was isolated in the laboratory, cultured, and inoculated onto greenhouse-grown corn plants. These plants exhibited typical grey leaf spot symptoms. The same pathogen was then re-isolated from these plants, confirming the presence of grey leaf spot. This is the first time that we have reported grey leaf spot in Canada.

Fungal Ear and Stalk diseases: Gibberella/Fusarium ear rots were observed at 23 locations: 13 in Quebec, 8 in eastern Ontario, and 2 in southern Ontario. The higher incidence in Quebec and eastern Ontario may be due to higher rainfall in late August and September in these regions. Compared to 2000,

common smut was more prevalent in 2001 and was found at 96 locations. This higher incidence of smut may be due to the drought conditions in 2001, especially in some late planted (late May-early June) drought stressed fields in the Ottawa-Carleton and Lanark areas. A severely drought stressed field was found with a 30% incidence of smut and low yield in Pakenham, Lanark county, ON. Head smut was found only at two locations. We have been monitoring head smut in a field at the AAFC Greenbelt Farm, Ottawa-Carleton County, ON, which has had a head smut incidence of 37%, 19%, 6%, and 16% (with as high as 32% in the centre of the field) in 1998, 1999, 2000, 2001, respectively. The reason for the high incidence of head smut in this field is not clear.

Incidence of anthracnose stalk rot/top die-back was high again this year, especially in Quebec. In north Chatham-Kent, ON, some fields which had 100% plant breakage above the ear due to anthracnose in 2000, still had 40-80% incidence 2001. *Fusarium* stalk rot was observed whenever the corn was mature, with a much higher incidence in southern Ontario than in eastern Ontario or Quebec; the reason for this could be increased drought stress and higher European corn borer damage in southern Ontario. Some *Pythium* stalk rot (also known as 'early death') was found in eastern Ontario and Quebec.

Bacterial diseases: Typical Stewart's wilt symptoms were found at 26 locations in Ontario, in the counties of: Chatham-Kent, Durham, Elgin, Essex, Huron, Leeds and Grenville, Middlesex, Oxford, Peel, Perth, Stormont Dundas and Glengarry, Waterloo, Wellington, and York. No Stewart's wilt was found in Quebec. The severity of Stewart's wilt decreased dramatically from 1999 to 2001 in Ontario, especially in southern Ontario. Most fields in 2001 had only a few diseased plants. One grain corn field, in Uxbridge, Durham county, may have had a yield loss due to Stewart's wilt; no wilt was present in this field in 2000. Only one of 34 samples collected with sunburn symptoms was positively identified as Stewart's wilt by an ELISA test; 30% of these type of samples were positively identified in 1999 (1). It appears that most sunburn symptoms in 2001 were probably caused by dry conditions. We collected six ear samples from a production field south of Ridgetown, ON, that was abandoned in 1999 due to severe Stewart's wilt; two of the six ears tested positive for Stewart's wilt.

No Holcus leaf spot (*Pseudomonas syringae*) and no Goss' bacterial wilt (*Clavibacter michiganensis subsp. Nebraskensis* = *Corynebacterium nebraskense*) were observed in 2001.

Viral diseases: As in 2000 (2), viral symptoms such as dwarfing, mosaic, and yellowish streaks were observed only in late-planted (during the last week of June) sweet corn. At two locations in Middlesex county, ON, one sample was positively identified as infected with MDM and the other with SCM (formerly MDMV-B). At one location in Elgin county, ON, and one in Les Maskoutains county, QC, samples were positively infected with SCM. In another field in Chatham-Kent, ON, plants had viral-like symptoms but tested negative for virus presence. Of these five locations, the highest incidence (10%) of virus infection was found in a Glanworth, Middlesex county, in a crop which was silking only by mid-September; the other four locations were mature and had less than 1% incidence. No WSM was identified in 2001.

Insects: European corn borer (ECB) damage was observed at 94 locations. Similar to 2000 (2), damage was greater in southern Ontario than in eastern Ontario or Quebec. In Chatham-Kent, Essex, and Middlesex counties, some fields had incidences as high as 80-100% with 50-100% stalk breakage. As usual, Bt corn showed excellent resistance and little damage from ECB.

Corn rootworm (CRW) damage was observed at 63 locations, with leaf feeding and silk pruning the predominant symptoms. Up to 60% root lodging caused by CRW was found in a field in Winchester, Stormont Dundas and Glengarry County, ON.

Aphids were numerous at many locations in both Ontario and Quebec, with heavy infestations on tassels and silks.

Mites: Mites, mostly likely the two-spotted spider mite (*Tetranychus urticae* Koch = *T. bimaculatus* Harvey), were numerous at 45 locations. Infestations intensified the already early drying of corn leaves due to the drought.

Summary: Overall in 2001, as a result of a very dry season, leaf diseases, such as common rust and eyespot, were less prevalent than in 2000, but common smut and damage from mites increased. Anthracnose and fusarium stalk rot were found at more locations in 2001 than in 2000. European corn borer caused more damage in southern Ontario. Stewart's wilt was much less common than in 1999 and 2000. MDM and SCM were primarily found on later-planted corn.

REFERENCES:

1. X. Zhu, L.M. Reid, D. Presello, and T. Woldemariam. 2000. Survey of Corn Pests in Ontario and Quebec. Can. Plant Dis. Survey 80: 48-50. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

2. X. Zhu, L.M. Reid, D. Presello, and T. Woldemariam. 2001. Survey of Corn Pests in Ontario and Quebec in 2000. Can. Plant Dis. Survey 81: 75-78. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

ACKNOWLEDGEMENTS:

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Table 1. Distribution of corn pests in Ontario and Quebec in 2001.

County	NO. OF LOCATIONS														
	Total	Rust	Eye-spot	Blight	Grey leaf spot	Ear rot	Smut	Head smut	ASR/ T-DB	Stalk rot	Wilt	Virus	ECB	CRW	Mites
ONTARIO															
Chatham-Kent	14	14		2	6	1	13		11	11	2	1	13	10	8
Dufferin	2	2	1		1		1			1			1		
Durham	4	4	3				2		1	2	3		2		3
Elgin	5	4		2			5		1	1	2	1	2	3	2
Essex	1	1					1		1	1	1		1	1	1
Frontenac	2	2	2				1		1	2			2	1	
Huron	2	2				1	2				1		1	2	
Lambton	1	1					1		1	1			1	1	1
Lanark	2	2	2			1	2		1	1			1	1	
Leeds and Grenville	6	6	4	1			5		4	5	2		6	3	2
Middlesex	12	11	4	1			7		5	6	7	2	8	3	3
Ottawa-Carleton	5	5	5	1		4	5	1	3	3			4	2	2
Oxford	4	4	2	1			3		2	2	2		3	3	3
Peel	3	3	1		1		3		1	2	1		2	2	
Perth	3	3		1			2			1	1		2		2
Prescott and Russell	4	4	3			1	3		2	3			3		
Renfrew	4	3	4			2	3		2	2			3	1	2
Stormont Dundas and Glengarry	8	8	8				8		5	6	1		7	6	6
Waterloo	2	2	1	1			2			1	1		1	2	
Wellington	5	5	4	1	1		4		2	4	1		5	4	
York	2	2	2				1		2	1	1		1		1
QUEBEC															
Argenteuil			2				2		1	2			2	1	1
Brome-Missisquoi		2	2				1			2			2	2	
D'Autray		1	1	1									1	1	
Joliette	1	1	1	1		1	1		1	1			1		
La Vallee-ou-Richelieu	1	1				1	1		1	1			1		
Lajemmerais	2	2				2	2		1	2			2	2	1
Le Bas-Richelieu	1	1	1			1	1			1			1	1	1
Le Haute-Yamaska	1	1	1							1			1	1	
Les Maskoutains	9	9	9	1		2	9	1	2	8		1	8	7	3
Mirabel	1	1	1			1	1			1			1		
Montcalm	2	2	1			1	2		1	1			1		1
Rouville	2	2	2			2			2	2			2	1	1
Vaudereuil	2	2	2			2	2		1	2			2	2	1
Total	118	113	69	14	9	23	96	2	55	80	26	5	94	63	45

Rust = common rust, Blight = northern leaf blight, ASR/T-DB = Anthracnose stalk rot/top-die back, Stalk rot = Gibberella/ Fusarium stalk rot, Wilt = Stewart's wilt (ELISA test positive), Virus = Maize dwarf Mosaic Virus (MDMV),and/or Sugarcane Mosaic Virus (SCMV), ELISA test positive. ECB = European corn borer, and CRW = Corn Rootworm.

CROP / CULTURE: Barley, Oat and Wheat
LOCATION / LOCATION: Manitoba and Saskatchewan

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TITLE / TITRE: **CEREAL SMUT SURVEYS, 2001**

INTRODUCTION AND METHODS:
In July 2001, cereal crops were surveyed for *Ustilago hordei, U. nigra, U. nuda, U. tritici, U. avenae* and *U. kolleri* in Manitoba and Saskatchewan. The area was covered by routes from Winnipeg - Estevan - Moose Jaw - Saskatoon - Prince Albert - Melfort - Yorkton - Roblin - Dauphin - Winnipeg, as well as one day trips around Winnipeg, MB. Fields were selected at random at approximately 10 - 15 km intervals, depending on the frequency of the crops in the area. An estimate of the percentage of infected plants (i.e., plants with sori) was made while walking an ovoid path of approximately 100 m in each field. Levels of smut greater than trace (<0.1%) were estimated by counting plants in a one m^2 area at a minimum two sites on the path.

RESULTS AND COMMENTS:
Loose smut (*Ustilago tritici*) was found in 21 % of the 117 fields of bread wheats surveyed. In most affected fields, there was a trace level of infection; two fields had levels of 0.1 %. In durum wheat, loose smut was found in 55 % of the 29 fields surveyed. In awned wheats (likely of the CPS wheat class), loose smut was found in 19 % of the 16 fields surveyed. In all of the infested durum and awned wheat fields, there was a trace level of infection.

Very few oat fields had smut (2 of 50 fields surveyed) as has been the case for several years. There was a trace level of infection in the two positive fields surveyed. Smutted oat fields were infected with *Ustilago avenae*.

A high incidence of smut was found in barley with 46% of the 91 fields surveyed containing infected plants. Incidence was particularly high in 6-row barley (64 % of 50 fields) with 66 % of affected fields having levels of trace to 0.1 % smutted plants. Infection levels in the other affected 6-row barley fields ranged from 0.5 to 7 % smutted plants. In 2-rowed barley, 10 of 41 (24 %) fields were affected with eight fields having trace levels and the other two fields having levels of 0.3 and 0.5 %. As in 2000 (Menzies et al. 2001), false loose smut (*Ustilago nigra*) and covered smut (*Ustilago hordei*) were not found.

REFERENCES
Menzies, J.G., F. Matheson, C. Saramaga and C. Hoeschen. 2001. Cereal Smuts Surveys, 2000. Can. Plant Dis. Surv. 81: 72.

FORAGES/ PLANTES FOURRAGÈRES

CROP: Alfalfa (*Medicago sativa*)
LOCATION: Saskatchewan

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TITLE: **BLOSSOM BLIGHT IN SEED FIELDS AND FOLIAR DISEASES OF ALFALFA IN SASKATCHEWAN, 2000-2001**

METHODS: The incidence of flower infestation with *Botrytis cinerea* and *Sclerotinia sclerotiorum* (causal agents of blossom blight) in commercial alfalfa seed fields in the main alfalfa seed production areas of Saskatchewan was assessed in July of 2000 (4 fields) and 2001 (9 fields). Flowers were collected at early flower and again 7-10 days later. For each sample, at least 40 mature alfalfa blossoms were collected and plated onto a semi-selective agar without surface sterilization. After 5-10 days of incubation, colonies were counted and the percentage infestation with each pathogen was calculated. Observations were summarized at the early and late bloom stage for each site, then within each region.

In addition, foliar disease severity was assessed in 14 alfalfa hay/seed fields in the central and southeastern regions on September 13, 2000. Each field was assessed at 4-5 sites along a teardrop-shaped circuit into the field; disease identification was based on visual symptoms.

RESULTS AND COMMENTS: In 2000, weather early in the growing season was quite variable, but conditions during flowering were hot and dry. As a result, the incidence of flower infestation was moderate to high at several sites at early flower, but declined substantially by late flower (Table 1). In 2001, the flowering period was one of the driest on record for the main alfalfa seed production areas of Saskatchewan, and pathogen levels were very low (Table 1). Seed production was well above average in 2001 (Gossen, unpublished), at least in part because both alfalfa flowering and leafcutting bee activity were stimulated by the hot, dry conditions.

Foliar disease severity was low at most locations in the fall of 2000 (Table 2); only 2 of 14 fields had more than 20% of the leaf area affected. Spring black stem [*Phoma medicaginis*] was the dominant disease in the southeast. Common leaf spot [*Pseudopeziza medicaginis*], which is favoured by warm conditions, occurred at low levels at several sites in both regions. In 2001, no formal survey was conducted, but foliar disease severity was extremely low throughout most of the alfalfa seed production area. However, in the southeast, where summer precipitation was at or above seasonal norms, severity was moderate to high in many fields.

ACKNOWLEDGEMENT: Thanks to the Saskatchewan Alfalfa Seed Producers Association and the individual farmers who assisted in the study, to Cheryl Armstrong-Cho for technical assistance, and to the Agriculture and Agri-Food Innovation Fund for partial funding of the project.

Table 1. Mean percent flower infestation (range in brackets) with *Botrytis cinerea* or *Sclerotinia sclerotiorum* at early and late bloom in commercial alfalfa seed production fields in Saskatchewan, 2000-2001.

Region	No. fields assessed	Early bloom		Late bloom	
		B. cinerea	*S. sclerotiorum*	*B. cinerea*	*S. sclerotiorum*
2000					
Northern grainbelt	2	8 (6-9)	66 (38-73)	6 (3-8)	9 (3-14)
Central grainbelt	2	12 (12-14)	54 (38-64)	5 (0-9)	3 (0-6)
2001					
Northern grainbelt	4	1 (0-3)	5 (2-10)	2 (0-3)	7 (0-25)
Central grainbelt	3	3 (0-10)	1 (0-3)	3 (1-7)	2 (1-3)
Southeast grainbelt	2	0	7 (5-8)	2 (0-4)	2 (0-4)

Table 2. Mean percent foliar disease severity (range in brackets) and diseases present in commercial alfalfa fields in central and southeast Saskatchewan, 2000.

Region, Dominant disease†	No. of fields	% Leaf area affected	Other diseases present
Central grainbelt			
CLS	3	5 (1-10)	SBS
SBS	2	15 (1-30)	CLS, YLB
YLB	1	40	SBS, CLS
Southeast grainbelt			
SBS	6	10 (1-20)	CLS, YLB
CLS	2	10 (1-20)	DM
Overall Mean (%)		12	

† CLS, Common leaf spot [*Pseudopeziza medicaginis*]; SBS, spring black stem [*Phoma medicaginis*], YLB, yellow leaf blotch [*Leptotrochila medicaginis*]; DM, downy mildew [*Peronospora trifoliorum*].

CROP: Alfalfa (*Medicago sativa* L.)
LOCATION: Alberta

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TITLE: DISEASE SURVEY OF FORAGE ALFALFA IN EAST-CENTRAL ALBERTA IN 2001

METHODS: Fifty-five alfalfa fields, ranging in age from first- to fifth-year stands, were surveyed in August, 2001. The survey was conducted in nine counties and two municipal districts, including Beaver, Camrose, Strathcona, Lamont, Minburn, Vermilion River, Two Hills, Smoky Lake, Thorhild, Sturgeon and Westlock in east-central Alberta (Fig. 1). Four plants were sampled at each of five random sites at each location, and foliar disease incidence was recorded. Disease severity was not recorded because disease levels were generally low in all fields. Soil samples (0 – 20 cm deep) were also collected at each site and composited for later analysis. Root disease severity was estimated using a scale of 0 to 4 (0 = no disease, 1 = small lesions on root, 2 = large lesions covering at least ¼ of root circumference, 3 = large lesions covering at least ½ of the root cross-section, and 4 = large lesions covering at least ½ of the root cross-section and completely girdling root). Plant samples were collected and diseased portions were cultured in the laboratory on water agar and acidified potato dextrose agar plates to recover fungal pathogens.

RESULTS AND COMMENTS: Leptosphaerulina leaf spot (*Leptosphaerulina briosiana*), spring black stem and leaf spot (*Phoma medicaginis*) and yellow leaf blotch (*Leptotrochila medicaginis*) were the most commonly observed foliar diseases, with an incidence in infested fields of 37.6, 21.7 and 20.3%, respectively (Table 1). Minor leaf diseases included anthracnose (*Colletotrichum* spp.), common leaf spot (*Pseudopeziza medicaginis*) and stemphylium leaf spot (*Stemphylium* spp.). These results are consistent with previous surveys (Wang et al., 2000; 1999).

Alfalfa mosaic virus (AMV) was present in 17 fields, with an average incidence of 12.9% (ranging from 5% to 25%) (Table 1). The infection rates were low at the time surveyed, and, unlike the Peace region surveyed in 1999 (Wang et al., 2000), no AMV hot spots were observed.

Root rot diseases, caused by various soil-borne pathogens, i.e. *Pythium* spp., *Rhizoctonia solani*, *Sclerotinia* spp., etc., were found in all counties and municipal districts surveyed. Disease incidence ranged from trace levels to 100%, but average severity levels were generally less than 1.0 on a 0 – 4 grading scale (Table 2).

REFERENCES:

1. Wang, H., Hwang, S.F., Turnbull, G.D., Chang, K.F, and Howard, R.J. 2000. Foliar diseases of alfalfa in the Peace region of Alberta in 1999. Can. Plant Dis. Surv. 80 : 68-69. (http://res2.agr.ca/london/pmrc/english/report/disease2000.html)

2. Wang, H., Hwang, S.F., Turnbull, G.D., Chang, K.F, and Howard, R.J. 1999. Disease survey of forage alfalfa fields in Alberta in 1998. Can. Plant Dis. Surv. 79 : 96-98. (http://res.agr.ca/lond/pmrc/english/report/disease99.html)

Table 1. Foliar disease incidence in alfalfa fields in east-central Alberta in 2001

Disease	Pathogen	No. fields infested	Incidence (%) in infested fields
Leptosphaerulina leaf spot	*Leptosphaerulina briosiana*	42	37.6 (10 - 70)[z]
Spring black stem and leaf spot	*Phoma medicaginis*	33	21.7 (5 - 55)
Yellow leaf blotch	*Leptotrochila medicaginis*	20	20.3 (10 - 60)
Alfalfa mosaic	Alfalfa mosaic virus (AMV)	17	12.4 (5 - 25)
Anthracnose	*Colletotrichum* spp.	7	15.0 (5 - 50)
Common leaf spot	*Pseudopeziza medicaginis*	5	15.0 (10 - 20)
Stemphylium leaf spot	Stemphylium spp.	4	10.0 (5 - 20)

[z] Values in parentheses are the range of disease incidence.

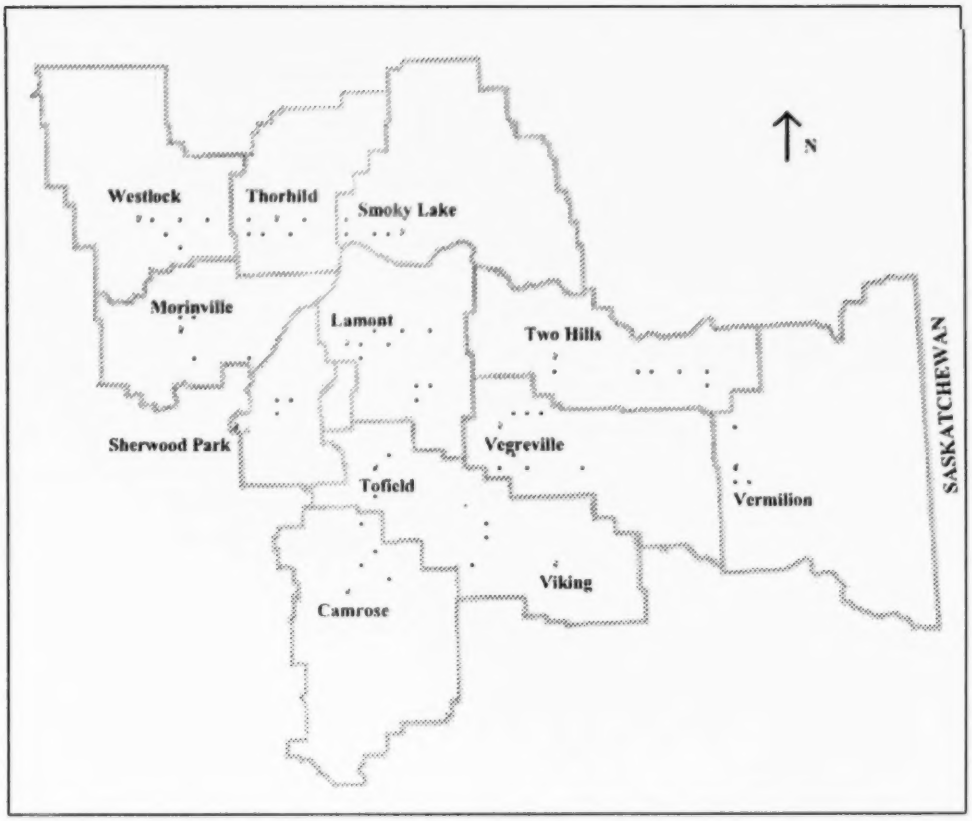
Table 2. Occurrence of root rot in alfalfa fields in east-central Alberta in 2001.

County or Municipal District [y]	No. of fields surveyed	Severity (0 - 4)[z] Mean (Range)		Incidence (%) Mean (Range)	
Beaver (Tofield and Viking)	5	0.7	(0.5 - 0.9)	51.0	(40 - 60)
Camrose (Camrose)	4	0.3	(0 - 0.9)	22.5	(0 - 60)
Lamont (Lamont)	9	0.6	(0 - 1.2)	43.9	(0 - 95)
Minburn (Vegreville)	7	0.8	(0.2 - 1.6)	62.7	(15 - 100)
Smoky Lake (Smoky Lake)	4	0.7	(0 - 1.1)	48.8	(0 - 80)
Strathcona (Sherwood Park)	3	0.4	(0.2 - 0.6)	33.3	(15 - 45
Sturgeon (Morinville)	4	0.6	(0.2 - 0.9)	45.0	(20 - 65
Thorhild (Thorhild)	5	0.7	(0 - 1.1)	48.8	(0 - 80)
Two Hills (Two Hills)	6	0.6	(0.3 - 1.1)	47.5	(20 - 100)
Vermilion River (Vermilion)	3	0.7	(0.2 - 1.7)	48.3	(20 - 100)
Westlock (Westlock)	5	0.7	(0.5 - 0.9)	51.0	(40 - 60)

[y] Each county or municipal district is shown with a representative city or town (in parentheses) on the survey map (see Fig. 1).

[z] Root rot severity: 0 = no disease, 1 = small lesions on root, 2 = large lesions covering at least ¼ of root circumference, 3 = large lesions covering at least ½ of root cross-section, and 4 = large lesions covering at least ½ of root cross-section and completely girdling root.

Figure 1. Distribution of alfalfa fields surveyed in east-central Alberta in 2001.



* Each symbol on the map represents one surveyed field.

Oilseeds and special crops/oléagineux et cultures spéciales

CROP: Canola
LOCATION: Alberta

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TITLE: **SURVEY OF FUSARIUM WILT AND OTHER CANOLA DISEASES IN ALBERTA, 2001**

METHODS: A total of 54 *Brassica napus* fields were surveyed between August 10 and August 28 in the central and east central canola production areas of Alberta. The fields were surveyed before swathing, at crop growth stages 79 to 83 (Bleiholder *et al.*, 1997). Plants were sampled by randomly selecting 100 plants along a "W"-shaped pattern in each field. The presence or absence of signs or symptoms on each plant was used to calculate disease incidence for the following diseases: sclerotinia stem rot (*Sclerotinia sclerotiorum*), blackleg (*Leptosphaeria maculans*), fusarium wilt (*Fusarium avenaceum.*), foot rot (*Fusarium spp., Rhizoctonia solani*), and aster yellows (AY phytoplasma). For sclerotinia stem rot, each plant was scored for either a main stem lesion or an upper stem or pod lesion. For alternaria pod spot, (*Alternaria brassicae, A. raphani*), the percent severity of lesions on the pods of each plant was assessed (Conn et al., 1990). If alternaria pod spot was observed in a field, but at a level estimated to be below 1%, the disease was recorded as a "trace". When other diseases were observed in a field, but not in the sample of 100 plants, the disease was also recorded as a "trace". When calculating means, all trace values were recorded as 0.1%. The results for each region were combined and mean disease incidence or severity values were determined.

RESULTS AND COMMENTS: The 2001 field season was quite dry throughout most of Alberta, resulting in lower than normal disease levels. Insect infestations also plagued much of the province, confounding disease diagnosis. Although the Peace region was not officially surveyed, reports from the Alberta Agriculture, Food and Rural Development Crop Specialists in the area indicated that there were no notable instances of fusarium wilt or other disease problems. Crop specialists in southern Alberta reported that disease surveys in their area were not warranted because of exceptionally dry conditions. In central Alberta, crops in general were very late, and swathing tended to be done prematurely, so often crops were surveyed while they were still very green. This may have resulted in underestimates of the incidence of fusarium wilt and other diseases. Anecdotal evidence to support this was provided by a field near Wetaskiwin that was surveyed at about crop stage 80 and found to have 10% incidence of fusarium wilt. Swathing was delayed, which allowed the field to be re-surveyed one week later; in that time, fusarium wilt incidence had risen to 40%. Moreover, Fusarium wilt in the central region seemed to have developed particularly late in the growing season, so if the canola had been left standing longer, incidence levels might have substantially increased.

Fusarium wilt was observed in 22 of the 54 fields, and incidence values ranged from 0 to 43%. Mean incidence was highest in the east central area (Table 1). Plants with symptoms of both fusarium wilt and blackleg or sclerotinia stem rot were not included in the calculations of fusarium wilt incidence due to the difficulty in reliably distinguishing symptoms. The average incidence in the two regions surveyed was 3.5%. This disease was first reported in 1999 (Lange et al., 2000). It is increasing in incidence in the east central region, and appears to be moving west, as infected plants were found in the Evansburg and Wetaskiwin areas, as well as west of Camrose (Table 2). Fusarium wilt has not previously been reported in these areas (Benard et al., 2001).

Sclerotinia stem rot was observed in 36 of the 54 fields and incidence values ranged from 0 to 21% for main stem lesions and from 0 to 10% for upper stem/pod lesions. Mean incidence was higher in the east central region (Table 1), but most fields overall showed very low levels. The provincial average was only 1.0% for main stem lesions and 0.5% for upper stem/pod lesions.

Blackleg was found in 27 of the 54 fields and incidence values ranged from 0 to 90%. Mean incidence was by far the highest in the east central area, while values in central Alberta were very low (Table 1). Significant hail damage may have exacerbated blackleg severity and incidence in the east central part of the province.

Foot rot was observed in 32 of the 54 fields, and incidence values ranged from 0 to 18%. The average was 2.0% (Table 1).

Aster yellows were observed in 43 of the 54 fields, with incidence values ranging from 0 to 5% (Table 1). Survey results indicate that levels were lower than in 2000, when aster yellows appeared to be on the increase (Benard et al., 2001).

Alternaria pod spot was found in 42 of the 54 fields. The highest severity (10%) was found in a field near Evansburg. The provincial average was 1.0% (Table 1).

REFERENCES:

1. Benard, D., R.M. Lange and L.M. Harrison. 2001. Survey of fusarium wilt and other diseases of canola in Alberta, 2000. Can. Plant Dis. Surv. 81:102-103.
2. Conn, K.L., J.P. Tewari, and R.P. Awasthi. 1990. A disease assessment key for Alternaria black spot in rapeseed and mustard. Can. Plant Dis. Surv. 70:19-22.
3. Bleiholder, H., Buhr, L., Feller, C., Hack, H., Hess, M., Klose, R., Meier, U., Stauss, R., van den Boom, T., Weber, E., Lancashire, P.D. and Munger, P., 1997. *Compendium of Growth Stage Identification Keys for Mono- and Dicotyledonous Plants*, 2nd ed. BBA, BSA, IGZ, IVA AgrEvo, BASF, Bayer, Novartis (joint publ.).
4. Lange, R. M., L. M. Harrison, and P. D. Kharbanda. 2000. A new Fusarium wilt of canola in Alberta, Canada in 1999. Joint Meeting of the Canadian Phytopathological Society and the Pacific Division of the American Phytopathological Society, June 18-21, 2000, Victoria, BC, Canada, p. 25 (vii-34) Victoria, BC: Canadian Phytopathological Society.

Table 1. Canola diseases in Alberta in 2001.

Region[1]	No. of fields	% Disease Incidence						% Disease Severity
		Sclerotinia[2] stem rot		Blackleg	Fusarium wilt	Foot rot	Aster yellows	Alternaria pod spot
		Main	Upper/pod					
Central	22	T[3]	0	T	<1.0	1	1	1
East Central	32	2	1	8.5	5.5	3	1.5	1
Overall	54	1	0.5	5	3.5	2	1	1

[1] The regions surveyed included the areas surrounding the following cities and towns:
Central = Evansburg, Gibbons, Leduc, Morinville, Stony Plain, Wetaskiwin (and east to Camrose).
East Central = Bonnyville, Camrose, Sedgewick, Vegreville.

[2] Sclerotinia stem rot lesions were scored either as main stem lesions or as upper stem/pod lesions.

[3] T = Trace amounts of disease (<0.5%) or disease was not found in the 100-plant samples but was noted in the field. Trace values are considered as 0.1% for calculating means.

Table 2. Fusarium wilt incidence by town and region in central and east central Alberta in 2001.

Region/ Town	No. fields with fusarium wilt	Minimum wilt incidence	Maximum wilt incidence	Mean wilt incidence
East Central	21/32	0	43	5.5
Bonnyville	1/17	0	43	8
Vegreville	6/6	0	7	2
Sedgewick	2/6	0	2	<1
Camrose (east)	2/3	0	6	3
Central	6/22	0	10	<1
Evansburg	2/5	0	2	<1
Wetaskiwin	3/5	0	10	2
Camrose (west)	1/3	0	0	1
Other	0	0	0	0
Overall	**27/54**	**0**	**43**	**3.5**

CROP: Mint (*Mentha* spp.)
LOCATION: Southern Alberta

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TITLE: OCCURRENCE OF STOLON ROT IN *MENTHA* SPP. IN SOUTHERN ALBERTA IN 2001

METHODS: Plant samples were taken from 14 fields of Scotch spearmint and one field of Black Mitchum peppermint in late April and early May 2001. The fields were located in southern Alberta, near Arrowwood, Bow Island and Carmangay. Ten plants were removed from each of five locations in each field for a total of 50 plants per field. Stolons from these plants were washed and subsequently rated for disease incidence by dividing the total number of diseased stolons by the total number of stolons. Disease severity was rated on a scale of 1-4 (0 = no stolon rot; 1 = 1-10% stolon discoloration; 2 = 11-25% stolon discoloration; 3 = 26-50% stolon discoloration and 4 > 51% discoloration). Two lesions on each infected plant sampled were cut into five 2-3 mm pieces, surface sterilized in 1% NaOCl for 2 minutes and passed through three, 1-minute rinses with deionized water. Sterilized tissues were aseptically transferred onto potato dextrose agar plates and incubated at either 4°C or 20°C for approximately 4-6 weeks. Microorganisms isolated on each plate were recorded.

RESULTS AND CONCLUSIONS: Disease incidence ranged from 27% to 100% and averaged 80%. Disease severity ranged from 0.3 to 4.0 and averaged 2.3 (Table 1). The average disease incidence and severity were higher in 2001 than in 2000 (unpublished observations).

The highest disease incidence and severity occurred in the 7-year-old crops at Arrowwood. Many rhizomes/stolons were rotted and had disintegrated. At Bow Island, more young shoots of mint emerged in lower areas than in hilly areas where the soil was drier. The fields had been irrigated early in the spring before sampling took place. Disease was less severe at Bow Island than at the other two locations. At Carmangay, one 3-year-old crop had a substantially higher disease incidence and severity than the other fields. No formal analysis of variance was done to compare the fields as the variance for the disease incidence and severity was not homogeneous. However it was generally evident that fields with the oldest stands and fields planted into previous mint-growing areas with no crop rotation had the highest disease incidence and severity.

A total of 4810 and 4250 colonies were isolated from diseased plant tissue incubated at 4°C and 20°C, respectively. Over 95% of the colonies were *Fusarium* spp., *Rhizopus* spp., *Helminthosporium* spp. or bacteria at both temperatures (Table 2). With samples incubated at 20°C, *Fusarium* spp. colonies comprised a 10% greater proportion of total colonies than at 4°C, with correspondingly fewer bacteria.

Table 1. Stolon length, disease incidence, disease severity and age of 15 mint fields surveyed in southern Alberta in 2001[a].

Location	Number of fields surveyed	Plant age (years)	Stolon length[b] (cm)	Disease incidence[c] (%)	Disease severity[d]
Arrowwood	4	7	20	100	3.8
Bow Island	1	2	29	46	1
	1	3	19	92	1.4
	2	4	18	63	1.3
Carmangay	4	1	17	75	1.8
	1	3	8	99	3.4
	2	4	15	68	1.5

[a] These results are based on five locations per field with ten plants per location sampled.
[b] Mean length of the longest live stolon on each plant sampled.
[c] Mean percentage of stolons that showed disease on each plant sampled.
[d] Mean severity rating: (0 = no stolon rot; 1 = 1-10% discoloration of total stolon area; 2 = 11-25% discoloration; 3 = 26-50% discoloration and 4 > 51% discoloration).
[e] This field was Black Mitchum peppermint; all of the others were Scotch spearmint.

Table 2. Microorganisms isolated from diseased stolons collected at 15 locations in Southern Alberta in the spring of 2001 through incubation at two temperatures.

Field location	Field number	*Fusarium* spp.		*Rhizopus* spp.		*Helminthosporium* spp.		bacteria	
		4°C	**20°C**	**4°C**	**20°C**	**4°C**	**20°C**	**4°C**	**20°C**
Arrowwood	F-1	41 [a]	59	16	12	33	28	9	1
Arrowwood	F-2	48	56	16	12	28	30	4	2
Arrowwood	F-3	25	42	37	16	27	33	10	5
Arrowwood	F-4	46	55	11	14	26	21	13	7
Bow Island	P-95	61	52	36	47	1	2	2	0
Bow Island	S7-125	41	45	41	39	18	8	0	5
Bow Island	S7-130	12	30	48	57	1	6	39	6
Bow Island	S7-150	49	30	37	57	7	6	7	6
Carmangay	7	60	60	20	23	16	15	2	0
Carmangay	1-Jul	58	51	13	16	22	23	5	4
Carmangay	9	27	46	3	8	7	19	53	13
Carmangay	11	25	41	12	9	14	24	39	16
Carmangay	33	33	45	37	41	23	12	5	1
Carmangay	33-1	52	53	30	32	17	13	2	1
Carmangay	33W	41	47	27	35	18	17	11	0
Percentage of total isolates		41	51	29	24	18	18	11	4

[a] Percentage of isolates from each site

CROP: Chickpea (*Cicer arietinum*)
LOCATION: Saskatchewan

NAME AND AGENCY:
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TITLE: OCCURRENCE OF ASCOCHYTA BLIGHT AND OTHER DISEASES OF CHICKPEA IN SASKATCHEWAN IN THE 2001 DROUGHT YEAR

METHODS: Ascochyta blight, caused by *Ascochyta rabiei,* is a major constraint to chickpea production in Saskatchewan. Formation of the sexual state of *Ascochyta rabiei,* which produces air-borne ascospores was assessed on overwintered chickpea stubble collected on June 7 from 10 fields in central Saskatchewan (Fig. 1). Infested stems and pods were washed in tap water and dried in a flow hood. Fruiting bodies were scraped onto glass slides containing sterile distilled water and cover slips were gently placed on top and firmly pressed down to release the contents of fruiting bodies. Slides were observed under the microscope for the presence of asci and ascospores.

In addition, we conducted a limited disease survey for diseases of chickpea across central and southern Saskatchewan. A total of 51 fields, seeded to various cultivars, were surveyed from three soil zones. An initial 31 fields from the brown soil zone were scored for ascochyta blight presence and sampled during the seedling stage on June 11 and 12 (Table 1, Fig. 1). Of the remaining 20 fields, 17 were surveyed and sampled on August 16 from the brown and dark brown soil zones and three on August 24 from the black (thin black) soil zone. Ascochyta blight severity was assessed using the 0 -11 Horsfall-Barratt scale (1) on 10 plants at five randomly chosen sites in each field sampled in August. The mean of the five ratings was converted to percent infected plant area. The presence in fields of sclerotinia white mold and botrytis grey mold was also noted. Fungal isolations were made on potato dextrose agar from samples in each field.

RESULTS AND CONCLUSIONS: Unlike 1999 and 2000, the growing season in 2001 was hot and dry in over 70% of Saskatchewan (3). Many chickpea crops suffered from severe moisture and heat stress. In some areas, both kabuli and desi cultivars exhibited symptoms of heat stress which included premature ripening and browning, purple discoloration of plant tissue in desi cultivars, and yellowish-brown discoloration of plant tissue in kabuli cultivars.

Ascospores and asci were found on overwintered chickpea stubble collected on June 7 in only one of 10 fields. Only pycnidia and conidia were detected on stubble from the remaining nine sites. As in 1999 and 2000 (2), the sexual state contributed to the spread of the pathogen through dispersal of air-borne spores in 2001 and possibly development of more virulent strains of *A. rabiei.*

Although, environmental conditions were unfavorable for disease development in most parts of the province, ascochyta blight was widespread in 2001. However, blight severity differed from region to region depending on rainfall. In the southern parts of Saskatchewan where more rain occurred, ascochyta blight was found on seedlings of chickpea by the second week of June by several growers (Table 1). By mid-August, disease severity was very high (up to 81-95%) in some fields seeded to cv. Sanford (Table 2). However, in most fields, disease severity was very low because of dry conditions unfavorable for severe blight epidemics. *Ascochyta rabiei* was isolated from samples in each of the 51 fields. Chickpea cultivars with the highest blight severity were all cultivar Sanford (Table 2). Observations of the relative resistance to ascochyta blight in the Crop Development Centre breeding nurseries was as follows: B-90 (Amit) = Myles > CDC Yuma > Sanford, similar to the trend observed in commercial fields (Table 2). Sclerotinia white mold and botrytis grey mold were present at low levels in some fields. *Sclerotinia sclerotiorum* and *Botrytis cinerea* were also isolated from chickpea tissue in some fields. Other pathogens isolated included *Fusarium* and *Alternaria* spp. On average, the low disease levels in 2001 resulted in improved seed quality over that in 2000. For example, the highest grade (1CW) increased from 43% of the harvested crop in 2000 to 61% in 2001 (3).

In 2000 and 2001, a number of growers in southern Saskatchewan who observed symptoms on chickpea from early- to mid-June, suggested that they were observing symptoms on chickpea much earlier than in the past. However, we know that it is not unusual to observe blight symptoms in early June. What seems to be making the difference is that ascochyta blight has become more prevalent due to a number of factors, including more inoculum build up in many fields as a result of expansion of chickpea cultivation in Saskatchewan, seed-borne inoculum and airborne spores. Also, most growers are now paying a lot of attention to ascochyta blight and are better able to identify symptoms earlier. When ascochyta is present, most growers are applying foliar fungicides (one to four applications) to reduce disease severity.

ACKNOWLEDGMENTS: Thanks to the Western Grain Research Foundation for financial support. Help from staff of Saskatchewan Agriculture and Food is gratefully appreciated.

REFERENCES

1. Horsfall, J.G., and Barratt, R.W. 1945. An improved grading system for measuring plant diseases. Phytopathology 35: 655 (Abstr.).
2. Armstrong, C., Chongo, G., Gossen, B.D., and Duczek, L.J. 2001. Mating type distribution and incidence of the teleomorph of *Ascochyta rabiei* (*Didymella rabiei*) in Canada. Can. J. Plant Pathol. 23:110-123.
3. Saskatchewan Agriculture and Food. 2001. Crop Report Number 27. Regina, SK. 11pp.

Table 1. Chickpea fields and cultivars from the brown soil zone of southern Saskatchewan in which ascochyta blight symptoms were found on seedlings on June 11 and June 12, 2001.

Location	Farmer	Cultivar	# Fields with ascochyta blight symptoms
Assiniboia	1	CDC Chico	6
	1	Myles	2
	2	CDC Yuma	1
	2	B90[†]	2
	2	Myles	2
	3	B90	3
	4	B90	2
	5	Desi	1
	6	Desi	1
	7	CDC Yuma	1
	8	Myles	1
	8	CDC Chico	1
	8	CDC Yuma	1
	9	Desi	1
	10	Desi	1
	11	Desi	1
Limerick	12	Desi	1
Mossbank	13	CDC Yuma	3
Total Kabuli			**20**
Total Desi			**11**

[†] Also known as cv. Amit

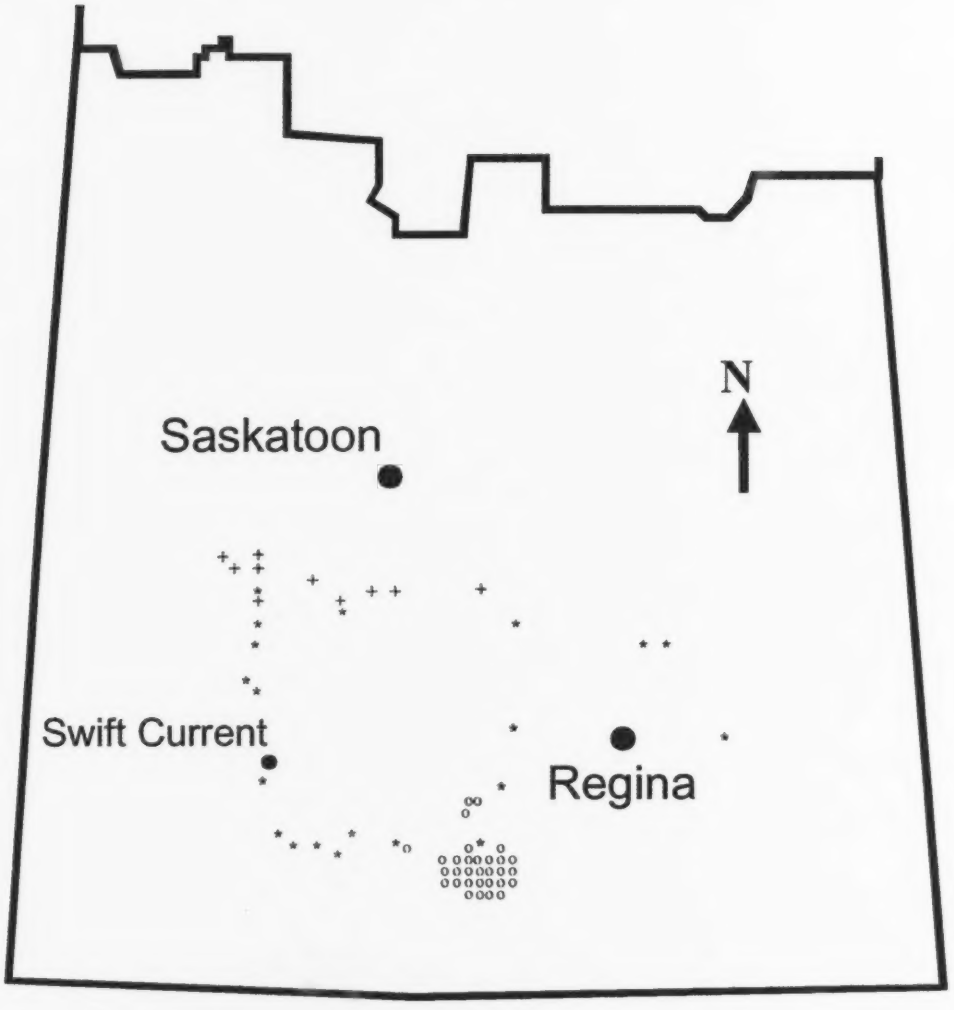

Fig. 1. Saskatchewan map (not to scale). Crosses represent fields where over-wintered chickpea stubble was collected for observation of the sexual state of *Ascochyta rabiei*, open circles represent chickpea fields where ascochyta blight was present on June 11 and 12, asterisks represent chickpea fields surveyed for foliar diseases on August 16 and 24, 2001.

Table 2. Ascochyta blight severity and occurrence of sclerotinia (S) and botrytis (B) in chickpea fields in central and southern Saskatchewan in 2001.

Field #	Cultivar	Soil Zone	RM No.	Ascochyta blight severity (%)[‡]	Presence of other diseases
1	Myles	Dark Brown	285	5	S
2	Sanford	Dark Brown	278	2	
3	Sanford	Brown	228	19	
4	Sanford	Brown	228	5	
5	Myles	Brown	167	2	
6	Kabuli	Brown	167	19	
7	Sanford	Brown	137	81	S
8	Sanford	Brown	107	38	
9	Sanford	Brown	76	38	
10	CDC Yuma	Brown	75	38	
11	Sanford	Brown	75	19	
12	B90 [†]	Brown	74	9	
13	CDC Yuma	Brown	73	19	
14	Sanford	Brown	73	81	S
15	Sanford	Brown	161	95	S
16	B90	Dark Brown	191	2	S, B
17	B90	Dark Brown	222	5	S, B
18	B90	Black	156	1	S
19	Sanford	Black	218	81	S, B
20	Sanford	Black	218	2	S

[‡] Rated using the 0 -11 Horsfall-Barratt scale and then converted to percent disease severity.
[†]Also known as cv. Amit

CROP: Canola
LOCATION: Manitoba

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TITLE: DISTRIBUTION, PREVALENCE AND INCIDENCE OF CANOLA DISEASES IN MANITOBA (2001)

METHODS: In August and September of 2001, 277 canola crops were surveyed in the eastern/interlake (46), southwest (87), northwest (71) and central (73) regions. All crops were *Brassica napus*. All crops were assessed for the prevalence (percent crops infested) and incidence (percent plants infected per crop) of sclerotinia stem rot (*Sclerotinia sclerotiorum*), aster yellows (phytoplasma), foot rot (*Fusarium* spp. and *Rhizoctonia* sp.), blackleg (*Leptosphaeria maculans*) and fusarium wilt (*Fusarium* spp.). Blackleg lesions that occurred on any part of the canola stem were assessed separately from basal stem cankers. The prevalence and percent severity of alternaria pod spot (*Alternaria* spp.) was determined.

In each canola crop, one hundred plants were selected in a regular pattern starting at a corner of the field or at a convenient access point. The edges of the fields were avoided. Twenty plants were removed from each of five points of a "W" pattern in the field. Points of the "W" were at least 20 paces apart. All plants were pulled up, removed from the field and examined for the presence of diseases.

RESULTS: A number of diseases were present in each of the four regions of Manitoba. Sclerotinia stem rot and blackleg were the most prevalent diseases throughout the province (Table 1). The prevalence of sclerotinia-infested crops ranged from 91% in the northwest region to 43% in the eastern/interlake region with a provincial mean of 76%. This decreased from a prevalence of 81% in 2000 (McLaren and Platford, 2001). Mean disease incidence ranged from 14% in the central region to 7% in the eastern/interlake region. The provincial mean of 12% was less than in 2000 and would result in about a 6% yield loss.

Blackleg basal cankers occurred in 23% of the crops surveyed in 2001 with disease incidence ranging from 7% in the both the northwest and eastern/interlake regions to 3% in the southwest region and with a provincial mean of 5%. Mean disease incidence was higher in 2000, with the highest value of 14% occurring in the southwest region (McLaren and Platford, 2001). When blackleg was detected in the crops surveyed in 2001, severe symptoms were observed in many cases. These caused a yield loss estimated at about 3% on a province-wide basis.

The mean prevalence of blackleg stem lesions was less than during the last three field seasons, with 72%, 66%, 54% and 20% of crops infested with stem lesions in 1998 (McLaren and Platford, 1999), 1999 (McLaren and Platford, 2000), 2000 (McLaren and Platford, 2001), and 2001, respectively. The mean incidence in 2001 was 3% which was less than in the three previous seasons.

The severity of alternaria pod spot was low (Table 2), with means of <3% in the southwest and northwest regions (Table 1). In the central and eastern/interlake regions, only 46% of fields with pod spot had a severity value recorded. Mean severity values for pod spot in these regions were <3%. The highest prevalence (63%) occurred in the eastern/interlake region (Table 1). In the northwest and southwest regions, pod spot was observed in 4% and 17% of the crops surveyed, respectively. This decreased from a prevalence of 22% in the northwest region and 31% in the southwest region in 2000. Although this

disease was most prevalent in the western part of the province during 1999-2000, pod spot was observed more frequently in the central and eastern/interlake regions of Manitoba in 2001.

The prevalence of aster yellows in crops surveyed in 2001 ranged from 24% in the eastern/interlake region to 10% in the northwest region with a provincial mean of 16%. This decreased from a prevalence of 40% in 2000 (McLaren and Platford, 2001). The average disease incidence was 1% in all regions. Foot rot was also observed in 4% of canola crops surveyed with a mean disease incidence below 5%.

Fusarium wilt was observed in 3% of canola fields in Manitoba with a mean disease incidence below 5%. These are unconfirmed results based on a visual survey of canola plants. Unfortunately, the diseased plants were not returned for laboratory analyses to confirm the presence of *Fusarium* spp.

REFERENCES:

1. McLaren, D.L. and Platford, R.G. 1999. Distribution, prevalence and incidence of canola diseases in Manitoba (1998). Can. Plant Dis. Surv. 79: 100-101.
2. McLaren, D.L. and Platford, R.G. 2000. Distribution, prevalence and incidence of canoladiseases in Manitoba (1999). Can. Plant Dis. Surv. 80: 79-80.
3. McLaren, D.L. and Platford, R.G. 2001. Distribution, prevalence and incidence of canola diseases in Manitoba (2000). Can. Plant Dis. Surv. 81: 108-109.

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Table 1. Number of canola crops surveyed and disease prevalence in Manitoba in 2001.

Crop Region	No. of crops surveyed	Sclerotinia stem rot		Blackleg				Alternaria pod spot		Aster yellows	
				basal cankers		stem lesions					
		P[1]	DI[2]	P	DI	P	DI	P	Mean % severity[3]	P	DI
E/Interlake	46	43	7	52	7	33	2	63	2.8	24	1
Central	73	73	14	29	4	37	3	53	1.3	15	1
SW	87	84	12	18	3	9	1	17	1.6	18	1
NW	71	91	12	6	7	8	6	4	1.5	10	1

[1] Mean percent prevalence.
[2] Mean percent disease incidence.
[3] In the central and eastern/interlake regions, only 46% of fields with pod spot had a severity value recorded.

Table 2. Distribution of incidence (sclerotinia, blackleg, aster yellows, and fusarium wilt) and severity (alternaria pod spot) classes in 277 crops of *Brassica napus* in Manitoba in 2001.

%	Percentage of crops with					
	Sclerotinia stem rot	Blackleg		Alternaria pod spot [1]	Aster yellows	Fusarium [2]
		basal cankers	stem lesions			
0	24	77	80	69	84	97
37260	33	18	18	14	16	2
37416	15	2	1	1	0	0
37579	14	2	0.5	1	0	1
21-50	12	1	0.5	0	0	0
>50	2	0	0	0	0	0

[1] Severity values were not recorded on 15% of crops.
[2] Based on visual assessment in the field; not confirmed by laboratory diagnosis.

CROP: Soybean
LOCATION: Ontario

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TITLE: SURVEY OF SOYBEAN FIELDS IN ONTARIO FOR VIRUSES IN 2001

INTRODUCTION AND METHODS: During the 2001 growing season aphids infested soybean crops throughout Ontario. The aphid species involved was identified as *Aphis glycines*, and was first confirmed near Chatham, in southwestern Ontario. *Aphis glycines* is an exotic species, that was found in Wisconsin and Michigan in 2000. This aphid is known to transmit Soybean mosaic virus (SMV) and other viruses. Because of the potential economic impact to growers and the soybean industry, Agriculture and Agri-Food Canada and the Ontario Ministry of Agriculture and Rural Affairs conducted a survey for the presence of *A. glycines* in the 2001 soybean crop, and for the presence of SMV, bean pod mottle virus (BPMV), tobacco ringspot virus (TRSV) and, for some samples, tobacco streak virus (TSV).

BPMV belongs to the Comovirus group (Brunt et al., 1996) and causes mottling and streaking of soybean seed coats. It is transmitted by Coleoptera including the bean leaf beetle, *Cerotoma trifurcata*, by mechanical inoculation, and by grafting, but is not transmitted by seed or by pollen.

SMV belongs to the Potyvirus group and symptoms on soybean include rugosity, dark green vein banding and light green interveinal areas, stunting, leaf curling, seed coat mottling, male sterility, flower deformation, reduced pubescence, necrosis, sometimes necrotic local lesions, system necrosis, and bud blight. It can be transmitted by over 30 species of aphids, mechanical inoculation, in seed, by pollen to the seed or by pollen to the pollinated plant. Symptoms may disappear soon after infection, especially at high temperatures.

TRSV belongs to the Nepovirus group and causes necrotic spots, mottling, chlorotic ringspots and vein banding. Symptoms disappear soon after infection. It is transmitted by nematodes, aphids, thrips, mechanical inoculation, in seed, and by pollen to the seed.

TSV belongs to Ilarvirus group and causes systemic necrosis and bud blight in soybean. It is transmitted by the insects *Frankliniella occidentalis* and *Thrips tabaci*, by mechanical inoculation, by grafting, in seed and by pollen to the pollinated plant.

The survey was conducted in the soybean growing counties of Ontario, ranging from Windsor to Ottawa. Samples of newly formed leaves or young leaves with unusual symptoms were collected in bags, identified, mapped and stored on ice in a portable cooler until processing.

A double antibody sandwich enzyme-linked immunosorbent assay (DAS-ELISA) was used to detect these viruses. A composite leaf sample from each site was homogenized with grinding buffer and loaded (2 replications) to an ELISA plate previously coated with the appropriate antibody (Agdia Inc., Elkart, IN). Plates were stored overnight in a refrigerator (4 ^{o}C). Each plate was washed, then filled with the enzyme conjugate and incubated for two hours at room temperature. The plate was washed again

and a substrate solution was added for colour development. After a few minutes to two hours, the wells containing samples positive for virus were coloured yellow; this was determined by the naked eye and by the use of an ELISA reader(405nm filter), capable of distinguishing even slight variation in colour. This test was done separately for each virus. The results of each reading were entered into a computer for further computation. When positive results were detected in only one of the replicates, or when there was an edge effect in the plate, or results were inconclusive, the test was repeated.

RESULTS AND COMMENTS: Young soybean leaf samples from over four hundred sites (Fig. 1) were processed and tested. In those from commercial fields, two samples from two different sites, located near Stoney Point, Essex County, and near Glencoe, Middlesex county, tested positive for TRSV. TSV was not found in any of the samples tested. SMV and BPMV were not found in commercial fields. However, these two viruses were found in samples which originated from soybean breeding nurseries. SMV and TRSV have been found in Ontario previously (Tu, 1988), but, to the best of our knowledge, this is the first report of BPMV in Ontario and Canada. Further tests are needed to corroborate these findings.

REFERENCES:

1. Brunt, A.A., Crabtree, K., Dallwitz, M.J., Gibbs, A.J., Watson, L.1996. Viruses of Plants. Descriptions and Lists from the VIDE Database. Centre for Agriculture and Bioscience (CAB) International.
2. Tu, J.C. 1988. Virus diseases of soybeans. Ontario Ministry of Agriculture, Food and Rural Affairs. Factsheet 88-066.

Figure 1. Distribution of fields included in Ontario soybean survey, 2001 in relation to counties.

CROP: Chickpea
LOCATION: Saskatchewan

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TITLE: SEED-BORNE PATHOGENS OF CHICKPEA IN SASKATCHEWAN IN 2001

METHODS: The results of agar plate tests conducted by four Saskatchewan companies on seed samples from the 2001 crop were summarized separately for kabuli and desi chickpea. The tests were conducted mainly to detect the pathogens causing ascochyta blight (*Ascochyta rabiei*), botrytis blight [grey mould] (*Botrytis cinerea*) and sclerotinia stem and pod rot (*Sclerotinia sclerotiorum*). Not all samples were tested for *Botrytis* and *Sclerotinia* but all were tested for *Ascochyta*. Figures for *Ascochyta* and *Botrytis* were classified according to crop districts [CD] of Saskatchewan (3). However, this was not done for *S. sclerotiorum* because infection levels are generally so low that comparisons of means would be valueless.

It was unknown which of the samples came from crops that had been treated with registered fungicides. Bravo (a.i. chlorothalonil) and Quadris (a.i. azoxystrobin) were both widely used as a foliar protectants against ascochyta blight on chickpea in 2001. Apron (a.i. metalaxyl) is generally used as a seed treatment against *Pythium* on kabuli chickpea and in 2001 Crown (a.i. thiabendazole + carbathiin) was registered to control seed-borne *Ascochyta* on both classes of chickpea.

RESULTS AND COMMENTS: In all areas of Saskatchewan except the southeast (CD 1 and parts of 2 and 3) the growing season was marked by either severe drought or well below normal precipitation. Harvest was completed very early and the average provincial chickpea yield (kabuli and desi combined) was only 76% of the 5-year average (1997-2001). Despite the drought in much of the chickpea-production area, ascochyta blight was a frequent concern among growers in Saskatchewan, especially on kabuli cultivars with unifoliolate leaves (1,2) and many fungicide applications were made.

By mid-December almost 1400 chickpea seed samples (nearly 1150 kabuli, 250 desi) had been tested by the four companies. This represents an increase of about 200 samples over the corresponding figure for 2000 (2), probably mainly due to an increase in chickpea acreage.

Levels of seed-borne *Ascochyta* varied among crop districts (Table 1), but not consistently for kabuli and desi types. The provincial means for desi and kabuli chickpea were similar, whereas in 2000 the mean for desi was considerably lower than that for kabuli cultivars (2). It is possible that this reflects a greater proportion of the kabuli crops in 2001 being the fern-leaf cultivar Amit (formerly known as B-90) which is more ascochyta-resistant than unifoliolate cultivars. The maximum recorded values of ascochyta seed infection were 23.8% in kabuli for a sample from CD 6B and 12.5% in desi for a sample from CD 3A-S.

The overall percentages of samples in which no *Ascochyta* was detected were 38 for kabuli and 46 for desi, values which are only slightly higher than in 2000 (2). Thus, despite dry weather and some

reduction in seed-borne infection levels in 2001 compared with 2000, ascochyta blight remained a major problem in chickpea production in 2001 on the moderately resistant cultivars now available.

Botrytis was detected in only 11% of the kabuli samples tested and 13% of the desi samples (Table 2). . Mean provincial infection levels were 0.1% or less in both types, compared with 1.7% for kabuli and 2.5% for desi in 2000 (2). Thus, *Botrytis* was not a significant problem on chickpea in Saskatchewan in 2001. Similarly, *S. sclerotiorum* was isolated from only a very small percentage of chickpea seed samples in 2001 and in these most commonly at levels of 0.5% or less.

REFERENCES:

1. Chongo G., Banniza S. and Warkentin T. 2002. Occurrence of ascochyta blight and other diseases of chickpea in Saskatchewan in the 2001 drought year. Can. Plant Dis. Survey 82: (this issue)

2. Morrall R.A.A., Carriere B., Cronje S., Schmeling D. and Thomson L. 2001. Seed-borne pathogens of chickpea in Saskatchewan in 2000. Can. Plant Dis. Survey 81: 111-114. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

3 Morrall R.A.A., Carriere B., Cronje S., Schmeling D. and Thomson L. 2001. Seed-borne pathogens of lentil in Saskatchewan in 2000. Can. Plant Dis. Survey 81: 126-129. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Table 1. Number of chickpea seed samples tested from August to mid-December, 2001 by four commercial companies and mean percent infection with *Ascochyta* in relation to Saskatchewan Crop Districts .

Crop District	KABULI			DESI		
	No. of samples tested	Mean % infection	% samples with 0% infection	No. of samples teste	Mean % infection	% samples with 0% infection
1A	5	1.3	20	5	1.1	0
1B	-	-	-	-	-	-
2A	49	0.6	39	28	0.5	37
2B	103	0.9	27	25	0.5	46
3AN	83	1.8	24	15	1.3	33
3AS	131	1.1	26	30	1.6	18
3BN	194	0.8	38	45	1	44
3BS	123	0.8	41	8	0.5	57
4A	135	0.4	36	5	0	100
4B	83	1.1	30	12	0.5	25
5A	8	0.6	n/a*	4	0.1	75
5B	1	0	100	4	3.4	0
6A	35	1	33	8	1	43
6B	54	2.1	37	23	0.8	61
7A	131	0.3	64	27	<0.1	93
7B	2	0	100	1	0	100
8A	-	-	-	2	2.5	0
8B	6	0.1	100	-	-	-
9A	1	1.8	0	-	-	-
9B	1	2.8	0	-	-	-
TOTAL	1145	0.9	38	242	0.8	46

*Not available

Table 2. Number of chickpea seed samples tested from August to mid-December, 2001 by four commercial companies and mean percent infection with *Botrytis* in relation to Saskatchewan Crop Districts.

Crop District	KABULI			DESI		
	No. of samples tested	Mean % infection	% samples with 0% infection	No. of samples tested	Mean % infection	% samples with 0% infection
1A	4	0.2	50	5	0.1	80
1B	-	-	-	-	-	-
2B	45	0.1	73	24	0.2	70
2B	88	0.1	71	21	0.1	85
3AN	43	<0.1	95	8	<0.1	88
3AS	82	0.1	80	23	<0.1	95
3BN	159	<0.1	95	40	0	100
3BS	91	<0.1	93	5	0	100
4A	133	<0.1	98	4	0	100
4B	44	0	100	3	0	100
5A	8	0.2	0	4	0.1	75
5B	1	0.3	0	4	0.2	50
6A	26	0.1	72	8	0.2	50
6B	47	0.1	87	15	0.1	81
7A	47	0	100	5	0	100
7B	2	0	100	1	0	100
8A	-	-	-	-	-	-
8B	2	0	100	-	-	-
9A	1	0.3	0	-	-	-
9B	1	0	100	-	-	-
TOTAL	824	<0.1	89	170	0.1	87

CROP: Lentil
LOCATION: Saskatchewan

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TITLE: SEED-BORNE PATHOGENS OF LENTIL IN SASKATCHEWAN IN 2001

METHODS: The results of agar plate tests conducted by four Saskatchewan companies on seed samples from the 2001 crop were summarized. The tests were conducted mainly to detect the pathogens causing ascochyta blight (*Didymella* [*Ascochyta*] *lentis*), anthracnose (*Colletotrichum truncatum*), grey mould and seedling blight (*Botrytis cinerea*) and sclerotinia stem and pod rot (*Sclerotinia sclerotiorum*). Not all samples were tested for *Colletotrichum*, *Botrytis* and *Sclerotinia* but all were tested for *Ascochyta*. Figures for *A. lentis* and *B. cinerea* were classified according to crop districts [CD] of Saskatchewan (1). However, this was not done for *C. truncatum* and *S. sclerotiorum* because infection levels are generally so low that comparisons of means would be valueless.

It was unknown which of the seed samples came from lentil crops that had been treated with registered fungicides. Bravo (a.i. chlorothalonil) is widely used as a foliar protectant against ascochyta blight and anthracnose, while Crown (a.i. thiabendazole + carbathiin) is often used as a seed treatment against seed-borne *Ascochyta* and *Botrytis*. Many of the samples tested came from crops of the relatively new ascochyta-resistant lentil cultivars. These were first widely grown in 2000 (1) and are now rapidly replacing older susceptible cultivars, except in the red lentil class.

RESULTS AND COMMENTS: In all areas of Saskatchewan except the southeast (CD 1 and parts of 2 and 3) the growing season was marked by either severe drought or well below normal precipitation. Harvest was completed very early and the average provincial lentil yield was only 70% of the 14-year average (1988-2001) and 63% of that in 2000.

By mid-December nearly 900 lentil seed samples had been tested by the four companies. This 25% decrease over the corresponding figure for 2000 was probably due to the drought and depressed farm economy, as seeded acreage was slightly higher than in 2000. Mean levels of seed-borne *Ascochyta* varied among crop districts (Table 1) and were generally higher in southern and southeastern areas, where rainfall was closer to normal levels. The highest value reported was 28.8% in a sample from CD 3BS and this had some influence on the mean for that CD.

On a provincial basis the mean level of seed infection was 0.6%, while 69% of samples tested 0% ascochyta. The corresponding figures for 2000 were 2.5% and 34%. This reduction in levels of seed-borne *Ascochyta* from 2000 to 2001 is undoubtedly related to both the change in lentil cultivars and the weather.

Botrytis was detected in only 37% of all samples tested, in contrast with 80% of samples tested in 2000, 69% in 1999 and 73% in 1998 (1). The mean infection level was 0.4%, compared with 2.3% in 2000,

0.7% in 1999 and 0.3% in 1998. In 2001, as in 1998, dry weather occurred in late summer, even in areas not previously affected by drought. This explains the low levels of seed-borne *Botrytis* in the samples.

Colletotrichum truncatum, which is never a highly seed-borne pathogen, was detected in only 7.1% of the samples tested, similar to 2000 and slightly lower than in the previous several years (1). However, anthracnose is now found in all major areas of lentil production in Saskatchewan. The pathogen is persistent in soil; field experience by the senior author in 2001 in CD 2B indicated a strong inverse relationship between anthracnose severity and length of rotation between lentil crops. In contrast with 2000 and 1999 (1), *S. sclerotiorum* was seldom isolated from lentil seed in 2001, even in areas where the pathogen is normally common on broad-leaved crops.

REFERENCE:

1. Morrall R.A.A., Carriere B., Cronje S., Schmeling D. and Thomson L. 2001. Seed-borne pathogens of lentil in Saskatchewan in 2000. Can. Plant Dis. Survey 81: 126-129. (http://res2.agr.ca/london/pmrc)

Table 1. Number of lentil seed samples tested from August to mid-December, 2001 by four commercial companies and mean percent infection with *Ascochyta* and *Botrytis* in relation to Saskatchewan Crop Districts.

Crop District	*Ascochyta*			*Botrytis*		
	No. of samples tested	Mean % infection	% samples with 0% infection	No. of samples tested	Mean % infection	% samples with 0% infection
1A	6	0.5	80	6	1.5	60
1B	0	-	-	-	-	-
2A	64	1.5	55	59	2	12
2B	195	0.6	65	188	0.7	39
3AN	34	0.2	65	32	0.2	59
3AS	41	1	75	37	0.2	62
3BN	168	0.6	57	155	0.2	76
3BS	44	3.9	39	41	0.2	71
4A	3	0.1	66	3	0	100
4B	8	0.1	75	7	0	100
5A	14	0.7	50	14	0.4	50
5B	6	<0.1	83	6	0.1	67
6A	67	0.1	87	67	0.2	76
6B	101	0.1	87	98	0.1	71
7A	76	0.1	79	68	<0.1	93
7B	27	0.3	63	24	0.1	67
8A	7	<0.1	86	7	0	100
8B	10	0	100	9	0	100
9A	6	0.2	67	1	0.5	0
9B	4	0	100	3	0	100
TOTAL	881	0.6	69	824	0.4	63

CROP: Pea
LOCATION: Saskatchewan

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TITLE: SEED-BORNE PATHOGENS OF PEA IN SASKATCHEWAN IN 2001

METHODS: The results of agar plate tests conducted by four Saskatchewan companies on seed samples from the 2001 crop were summarized. The tests were conducted mainly to detect the pathogens causing ascochyta blights (*Mycosphaerella* [*Ascochyta*] *pinodes* and *A. pisi*), botrytis blight (*Botrytis cinerea*) and sclerotinia stem and pod rot (*Sclerotinia sclerotiorum*). Not all samples were tested for *Botrytis* and *Sclerotinia* but all were tested for the ascochyta blight pathogens. Figures for *Ascochyta* spp. and *B. cinerea* were classified according to crop districts [CD] of Saskatchewan (1). However, this was not done for *S. sclerotiorum* because infection levels are generally so low that comparisons of means would be valueless.

RESULTS AND COMMENTS: In all areas of Saskatchewan except the southeast (CD 1 and parts of 2 and 3) the growing season was marked by either severe drought or well below normal rainfall. Harvest was completed very early and the average provincial pea yield was only 73% that of the 14-year average (1988-2001) and 55% of the mean of 1999 and 2000, which were record years.

By mid-December about 550 pea seed samples had been tested by the four companies, slightly more than in 2000 (2). Mean levels of seed-borne *Ascochyta* spp. varied among crop districts (Table 1). The highest levels were in southeastern crop districts, where the greatest rainfall occurred and the maximum recorded value was 18.5% in a sample from CD 3AS. On a provincial basis mean seed infection was 0.9% and the percentage of samples in which no infection was detected was 61%. These values were 71% lower and 154% higher, respectively, than corresponding values for 2000 (2).

Of considerable interest was the fact that most isolates of *Ascochyta* from pea seed in southern Saskatchewan were *A. pisi*. This species is normally found more commonly in southern crop districts, but in a mixture with *A. pinodes*, which is by far the dominant species in traditional pea-growing areas further north. However, in 2001 many samples from the south were infected exclusively with *A. pisi*.

Botrytis was detected in only 7% of pea samples tested compared with 28% in 2000(2). Also, the mean seed infection level was less than 0.1% and there was little variation among crop districts. *Botrytis* was again not a problem on pea crops in Saskatchewan in 2001. Similarly, *S. sclerotiorum* was isolated from an extremely small percentage of seed samples tested in 2001 and always at very low levels.

REFERENCES:

1. Morrall R.A.A., Carriere B., Cronje S., Schmeling D. and Thomson L. 2001. Seed-borne pathogens of lentil in Saskatchewan in 2000. Can. Plant Dis. Survey 81: 126-129. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

2. Morrall R.A.A., Carriere B., Cronje S., Schmeling D. and Thomson L. 2001. Seed-borne pathogens of pea in Saskatchewan in 2000. Can. Plant Dis. Survey 81: 130-132. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Table 1. Number of pea seed samples tested from August to mid-December, 2001 by four commercial companies and mean percent infection with *Ascochyta* and *Botrytis* in relation to Saskatchewan Crop Districts .

Crop District	*Ascochyta*			*Botrytis*		
	No. of samples tested	Mean % infection	% samples with 0% infection	No. of samples tested	Mean % infection	% samples with 0% infection
1A	6	3.3	33	3	0.3	33
1B	3	3.7	33	2	1.5	0
2A	10	2.5	63	10	0	100
2B	37	0.5	55	29	0.1	92
3AN	5	1.2	20	4	0	100
3AS	54	2.6	27	30	0	100
3BN	44	0.6	68	36	0.1	89
3BS	12	1.4	45	11	0	100
4A	-	-	-	-	-	-
4B	1	0	100	1	0	100
5A	14	0.2	69	6	0	100
5B	40	1	58	36	<0.1	97
6A	57	0.1	78	36	<0.1	94
6B	46	0.1	89	33	<0.1	97
7A	20	<0.1	95	17	0	100
7B	21	0.1	81	16	0	100
8A	58	1.9	23	27	<0.1	93
8B	58	0.4	36	19	0.1	95
9A	36	0.8	57	13	<0.1	92
9B	31	0.9	52	19	0	100
TOTAL	553	0.9	61	348	<0.1	93

CROP: Canola
LOCATION: Saskatchewan

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TITLE: SURVEY OF CANOLA DISEASES IN SASKATCHEWAN, 2000

METHODS: A total of 95 fields of Brassica napus were surveyed between August 10 and 20 in the major canola production regions of Saskatchewan including the north-east (13), north-central (20), north-west (11), east-central (30), central (11) and south-east (10). Canola fields were surveyed before swathing and when the crop was between growth stages 5.2 and 5.3 (Canola Council of Canada). Disease assessments were made in each field by collecting 20 plants at each of 5 sites separated by at least 20 m and 20 m from the edge of the field. The presence or absence of lesions on each plant was determined to give percent disease incidence for the following diseases: sclerotinia stem rot (*Sclerotinia sclerotiorum*), blackleg (*Leptosphaeria maculans*), aster yellows (AY phytoplasma), foot rot (*Rhizoctonia, Fusarium*), and fusarium wilt (*F. avenaceum, F. oxysporum*). For sclerotinia stem rot, each plant was scored for either a main stem lesion or an upper branch/pod lesion. For blackleg, each plant was scored for either a severe basal stem canker or any other type of blackleg stem lesion. For alternaria pod spot (*Alternaria brassicae, A. raphani*), the percent severity of lesions on the pods of each plant was assessed. If alternaria pod spot was present in a field, but at a level estimated to be below 1%, the disease was recorded as a "trace". Similarly, when the other diseases were observed in a field, but not in the sample of 100 plants, the disease was recorded as a "trace". When calculating means, all trace values were counted as 0.1%. Field results were combined for each region and mean disease incidence or severity values were determined.

RESULTS AND COMMENTS: Sclerotinia stem rot was observed in only 40 of the 95 fields surveyed and incidence values ranged from 0 to 6% for main stem lesions and from 0 to 17% for upper branch/pod lesions. Mean incidences were low in all regions, with the highest incidences occurring in the central region (field under irrigation) and the south-east region (Table 1). The overall mean incidence values for the province were 0.6% main stem lesions and 0.8% upper branch/pod lesions, suggesting that sclerotinia stem rot resulted in little yield loss in 2001. The low sclerotinia stem rot incidences were an indication of the dry conditions experienced in most of the canola production regions, which resulted in poor stand density and reduced yields. Comparatively, overall mean sclerotinia stem rot incidence values were higher in 2000 (8% main stem lesions; 6% upper branch/pod lesions) and 1999 (13% main stem lesions; 9% upper branch/pod lesions) (Pearse et al. 2001; Pearse et al. 2000; Canola Council of Canada; R.A.A. Morrall, unpublished data).

Blackleg was observed in 35 of the 95 fields surveyed. Mean incidence values ranged from 0 to 6% for basal stem lesions and 0 to 37% for lesions occurring elsewhere on the stem. Blackleg incidence values were highest in the north-west region and relatively low elsewhere in the province (Table 1). The overall mean incidence values for the province were 0.3% for basal stem cankers and 3% for lesions found elsewhere on the stem. The majority of blackleg lesions were scored as occurring not as basal stem cankers but elsewhere on the stem, indicating limited impact on seed yield and quality. The overall mean

blackleg incidence values in 2001 were similar to 2000 (1% basal stem; 3% other) and lower than in 1999 (3% basal stem; 8% other).

Aster yellows was observed in 40 of the 95 fields surveyed. Overall mean incidence for the province was 0.3% (Table 1). Incidence ranged from 0 to 3% and aster yellows was prevalent in all the regions surveyed. Comparatively, overall mean aster yellows incidence was lower in 2001 compared to 2000 (1.6%) and 1999 (1.0%). There has been some concern in previous years that aster yellows is increasing in the province, but the dry conditions experienced in most of the province in 2001 did not appear to favour leafhopper migration, feeding and survival.

Foot rot was observed in 13 of the 95 fields surveyed and was recorded only in the north-central, north-west and east-central regions (Table 1). Disease incidence ranged from 0 to 4% and the overall mean incidence for the province was 0.2%. This incidence is lower compared to 2000 (1.2%) and 1999 (0.9%).

Alternaria pod spot was observed in 50 of the 95 fields surveyed but mostly at trace severity levels. The highest mean severity was observed in the north-west region (Table 1). Mean alternaria pod spot severity was slightly lower in 2001 (0.2%) as compared to 2000 (0.5%) and 1999 (0.4%). Dry conditions continued into late summer in most regions, so alternaria pod spot severity did not likely increase at harvest.

Fusarium wilt was observed in 5 of 95 fields surveyed and the overall mean incidence for the province was 0.3%. Fusarium wilt was confirmed in one field in the north-central region and four fields in the north-east region. Incidence values were low except for one field in the north-east region with an incidence of 19%. Fusarium wilt has not been observed in Saskatchewan in most survey years but is gaining in importance in Alberta (Lange et al., 2000).

REFERENCES:

1. Canola Council of Canada. (http://www.canola-council.org/manual/canolaframes.html)

2. Lange, R.M., L.M. Harrison and P.D. Kharbanda. 2000. A new fusarium wilt of canola in Alberta, Canada in 1999. Abstracts of papers presented at joint meeting of Can. Phytopathol. Soc. and Pacific Div. of Amer. Phytopathol. Soc., June 18-21, 2000, Victoria, B.C. p.25.

3. Pearse, P.G., R.A.A. Morrall, 2000, R. Kutcher, D.A. Kaminski, L.J. Duczek, R.K. Gugel, S.R. Rimmer, R. Berard. 2000. Survey of canola diseases in Saskatchewan, 1999. Can. Plant Dis. Surv. 80:81-82. (http://res2.agr.ca/london/pmrc/english/report/disease2000.html)

4. Pearse, P.G., R.A.A. Morrall, 2000, R. Kutcher, M. Keri, D.A. Kaminski, R. Gugel, K. Anderson, C. Trail, W. Greuel. 2001. Survey of canola diseases in Saskatchewan, 2000. Can. Plant Dis. Surv. 81:105-107. (http://res2.agr.ca/london/pmrc/english/report/disease2001.html)

Table 1. Canola diseases in Saskatchewan in 2001.

Region[1] (No. of Fields)	**Mean % Disease Incidences**							**Mean % Severity**
	Sclerotina[2]		Blackleg[3]		Aster yellows	Foot rot	Fusarium wilt	Alternaria pod spot
	Main	Upper	Basal	Other				
North-east (13)	1	T	T [4]	1	0.2	0	2	0.2
North-central (20)	T	T	T	2	0.4	0.2	T	T
North-west (11)	T	T	1	15	0.2	0.5	0	1.1
East-central (30)	T	T	T	T	0.3	0.3	0	T
Central (11)	T	4	T	1	0.3	0	0	0.1
South-east (10)	2	1	0	1	0.5	0	0	0.4
Overall Mean (95)	0.6	0.8	0.3	3	0.3	0.2	0.3	0.2

[1] The Rural Municipalities (RM) surveyed in the major canola production regions include:

North-east = RM 426, 427, 428, 457, 487, 488
North-central = RM 368, 398, 399, 401, 428, 429, 430, 431, 459, 460, 461
North-west = RM 437, 466, 497, 498
East-central = RM 184, 185, 186, 214, 243, 244, 246, 247, 276, 277, 278, 308, 336, 369
Central = RM 226, 254, 255, 315, 345, 346
South-east = RM 66, 67, 96, 97, 125, 126, 155, 156

[2] Sclerotinia stem rot lesions were scored as either a main stem lesion or as an upper branch/pod lesion.

[3] Blackleg lesions were scored as either a severe basal stem canker or as any other type of stem lesion.

[4] T = trace amounts of disease (< 1%); or, were not found in the 100 plant sample but present in the field. In calculating means, trace values are 0.1%.

CROP: Flax
LOCATION: Manitoba

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TITLE: **DISEASES OF FLAX IN MANITOBA AND SASKATCHEWAN IN 2001**

METHODS: A total of 50 flax crops in Manitoba and 38 in Saskatchewan was surveyed in 2001. Twenty crops were surveyed during the second week in July, 55 crops during the third week in August, and 13 crops during the last week in August. Solin flax with low linolenic acid and yellow seed colour was distinguished in 8% of the crops surveyed in August, and linseed constituted 92% of the crops surveyed. Crops surveyed were selected at random along preplanned routes in the major areas of flax production. Each crop was sampled by two persons walking 100 m in opposite directions in the field following an "M" pattern. Diseases were identified by symptoms and the incidence and severity of each disease were recorded. Stand and vigour were rated on a scale of 1 to 5 (I = very good, and 5 = very poor).

In addition, 17 samples of flax plants were submitted for analysis to the Manitoba Agriculture and Food Crop Diagnostic Centre by agricultural representatives and growers.

RESULTS AND COMMENTS: Eighty-six percent of the flax crops surveyed in 2001 were rated very good for stand establishment, and 80% had very good vigour. Twenty percent of the crops surveyed were seeded late and were expected to be late for maturity and harvesting. Growing conditions were generally good except for the above normal temperatures during the flowering period which had affected the seed set in some crops.

Pasmo (*Septoria linicola*) was observed in 60% of the crops surveyed (Table 1) especially those surveyed in late August. The prevalence and severity of pasmo in 2001 were lower than in 2000 but similar to previous years (1, 2), due perhaps to the warm weather during the second half of the growing season. In the infested crops, pasmo incidence ranged from 1% to 100% infected plants, and severity ranged from 1% to >60% stem and leaf area affected. Only 6% of the crops had >60% plants severely infected with pasmo.

No heavy lodging was recorded in flax crops in 2001, and this resulted in a very low levels of stem infections with *Sclerotinia sclerotiorum* or foliage infection with *Alternaria* spp.

Root infections and fusarium wilt (*Fusarium oxysporum f.sp. lini*) were observed in 74% of flax crops in 2001 in comparison with 54% and 93% of crops, respectively in 2000 and 1999 (1, 2). Incidence of fusarium wilt ranged from trace to 15%.

Powdery mildew (*Oidium lini*) was observed in 20% of crops surveyed in 2001 with a severity range from trace to 10% leaf area affected. The incidence and severity of this disease were low in 2001 in spite of the increases since it was first reported in western Canada in 1997 (1, 2).

Traces to 5% affected plants were observed for aster yellows (phytoplasma) in 10% of the flax crops in 2001. The incidence and severity of aster yellows in 2001 were similar to 2000 but lower than in 1999 when the severity of this disease was higher than in any of the last 10 years (1).

Rust (*Melampsora lini*) was not observed in any of the 88 crops surveyed, nor in the rust-differential flax nurseries planted at Morden, Portage la Prairie, Saskatoon, and Indian Head.

Of the 17 flax samples submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre, two were affected by pasmo, and four affected by fusarium wilt/root rot (*Fusarium oxysporum f.sp. lini* and other *Fusarium* spp.). In addition to diseases, nine samples were affected by herbicide injury, and two samples by various environmental factors.

ACKNOWLEDGEMENTS: The assistance of Lawrence Wiebe and Maurice Penner in conducting this survey is gratefully acknowledged.

REFERENCES:

1. Rashid, K. Y., M. Desjardins, S. Duguid, and R. G. Platford 2001. Diseases of flax in Manitoba and Saskatchewan in 2000. Plant Dis. Surv. 81:123-125. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html.)

2. Rashid, K. Y., E. O. Kenaschuk, S. Duguid, and R. G. Platford. 2000. Diseases of flax in Manitoba and eastern Saskatchewan in 1999. Can. Plant Dis. Surv. 80:92-93. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html.)

Table 1. Incidence and severity of fusarium wilt, pasmo, and powdery mildew in 88 crops of flax in Manitoba and Saskatchewan in 2001.

Crops affected by											
fusarium wilt				**pasmo**				**powdery mildew**			
Crops		Disease		Crops		Disease		Crops		Disease	
No.	%	Incid.[1] %	Sever.[2] %	No.	%	Incid. %	Sever. %	No.	%	Incid. %	Sever. %
23	26	0	0	40	46	0	0	70	80	0	0
28	32	37260	37260	15	17	37265	37260	15	17	37265	37260
31	35	37395	37385	10	11	37558	37385	3	3	37558	37385
2	2	20-40	37548	15	17	30-60	37548	0	0	30-60	37548
4	5	>40	10-40	8	9	>60	10-50	0	0	>60	10-50

[1] Incidence = Percentage of infected plants in each field.

[2] Severity = Percentage of roots affected by fusarium wilt, stems affected by pasmo, or leaves affected by powdery mildew.

CROP: Sunflower
LOCATION: Manitoba

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TITLE: DISEASES OF SUNFLOWER IN MANITOBA IN 2001

METHODS: Thirty-four sunflower crops in Manitoba were surveyed in 2001. Ninety percent of the crops were confectionery hybrids and 10% were oilseed hybrids. Six crops were surveyed during the 2nd week of August, 10 crops during the 3rd week of August, and 18 crops during the 1st week of September. Crops were surveyed along preplanned routes in the major areas of sunflower production. Each crop was sampled by two persons walking 100 m in opposite directions in the field following an "M" pattern. Diseases were identified by symptoms and the percent incidence of downy mildew (*Plasmopara halstedii*), sclerotinia wilt or head and stem infections (*Sclerotinia sclerotiorum*), rhizopus head rot (*Rhizopus* spp.), and verticillium wilt (*Verticillium dahliae*) were estimated. Disease severity for rust (*Puccinia helianthi*), leaf spots (*Septoria helianthi* and *Alternaria* spp.), powdery mildew (*Erysiphe cichoracearum*) and stem infections (*Phoma* spp. & *Phomopsis* spp.) were measured as percent leaf and stem area infected. A disease index was calculated for each disease in every crop based on disease incidence or disease severity and crops were rated for earliness, stand and vigour (Table 1).

In addition, 16 samples of sunflower plants were submitted for analysis to the Manitoba Agriculture and Food Crop Diagnostic Centre by agricultural representatives and growers.

RESULTS AND COMMENTS: Eighty-eight percent of the sunflower crops surveyed in 2001 had excellent to good stands, and 85% of the crops had excellent to good vigour. Twenty percent of the crops were seeded late and were expected to mature very late. Growing conditions were generally good except for above normal temperatures during the flowering period which had affected the seed set in some crops. Traces to 5% infestation of sunflower midge (*Contarinia schulzi*) were observed in 10% of the crops in the Red River Valley; however, the severity of infestation was extremely low in comparison to the previous years (1, 2).

Sclerotinia wilt/basal stem infection was present in 65% of the crops surveyed, with incidence ranging from trace to 10% infected plants (Table 1). Sclerotinia head rot and mid-stem breakage caused by ascospore infections were present in 33% of crops surveyed during the first week of September with incidence ranging from trace to 10% infected plants. The dry weather conditions towards the end of the season resulted in lower incidences of sclerotinia head rot than in previous years (1). However there were higher incidences of rhizopus head rot than in previous years (1) due, perhaps, to high temperatures in late August and early September, and insect/grasshopper damage to the sunflower heads in certain crops.

Verticillium wilt was present in 48% of the crops surveyed, with incidence ranging from trace to 20% infected plants (Table 1). The prevalence and incidence of verticillium wilt in 2001 was lower than in 2000 and 1999 (1, 2) in spite of the increased acreage of confectionery hybrids (90% of total acreage).

Downy mildew was observed in 15% of the crops surveyed but the incidence was very low (trace to 1%) in most crops (Table 1). This is the 4th consecutive year where dry soil conditions and above normal soil temperatures at the seedling stage may have contributed to low incidence of downy mildew.

Rust was present in 27% of the crops surveyed, with severity ranging from trace to 5% leaf area affected in most affected crops and up to 20% leaf area affected in a few crops (Table 1). The incidence and severity of rust were lower in 2001 than in 2000 and 1999 (1, 2).

Traces to 10% leaf area covered by spots caused by *Septoria helianthi* and *Alternaria* spp. were observed in 32% of crops surveyed in 2001. Phoma stem lesions were present in 12% of the crops at trace to 5% stem area affected (Table 1). Trace levels of phomopsis stem lesions were observed in a few crops. Traces to 5% leaf area affected by powdery mildew were observed in 12% of the crops towards the end of the season. Traces of aster yellows caused by a phytoplasma were observed in several crops in 2001.

Of the 16 samples submitted to the Manitoba Agriculture and Food Crop Diagnostic Centre, two samples were identified as black stem rot caused by *Phoma* spp., one leaf spot caused by *Alternaria* spp. In addition to diseases, four samples were affected by environmental and physiological factors, one affected by nutrient deficiency, and eight were affected by herbicide injury.

ACKNOWLEDGEMENTS: The assistance of Lawrence Wiebe and Maurice Penner in conducting this survey is gratefully acknowledged.

REFERENCES:

1. Rashid, K. Y., M. Desjardins, and R. G. Platford 2001. Diseases of sunflower in Manitoba in 2000. Can. Plant Dis. Surv. 81:138-140. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

2. Rashid, K. Y. and R. G. Platford. 2000. Diseases of sunflower in Manitoba in 1999. Can. Plant Dis. Surv. 80:112-113. (http://res2.agr.ca/london/pmrc/english/report/repmenu.html)

Table 1. Prevalence and intensity of diseases and estimated plant stands in sunflower crops in Manitoba in 2001.

Disease	Crops affected		Disease/Stand index[1]	
	No.	%	Mean	Range
Sclerotinia wilt	22	65	1.1	T-2
Sclerotinia head rot/stem rot	6	33	1.0	T-1
Verticillium wilt	16	48	1.0	T-1
Downy mildew	4	15	1.0	T-1
Rust	9	27	1.1	T-2
Septoria leaf spot	11	32	1.0	T-1
Powdery mildew	4	12	1.0	T-1
Phoma stem lesions	4	12	1.0	T-1
Earliness[2]	7	20	1.7	1-3
Stand	4	12	1.5	1-4
Vigour	5	15	1.8	1-3

[1] Disease index is based on a scale of 1 to 5: Trace (T) = < 1%, 1= 1% to 5% disease, 2= 5% to 20% disease, 3= 20% to 40% disease, 4= 40% to 60% disease, and 5= greater than 60% disease levels. Index is based on disease incidence for downy mildew, verticillium wilt, and sclerotinia infections; and on disease severity measured as percent leaf area affected for rust and leaf spots.

[2] Indeces for earliness, stand, and vigour are based on 1-5 scale (1= early/very good and 5= late/very poor). Only 7 crops were late, 4 crops had a poor stand, and 5 crops had poor vigour.

CROP: Field Pea (*Pisum sativum* L.)
LOCATION: Alberta

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TITLE: **SURVEY OF POWDERY MILDEW AND ASCOCHYTA BLIGHT ON FIELD PEA IN CENTRAL ALBERTA IN 2001**

METHODS: A total of 42 fields were surveyed in central Alberta area for powdery mildew (*Erysiphe pisi*) (Fig. 1) and ascochyta blight (*Ascochyta pisi*, *Phoma medicaginis var. pinodella* and *Ascochyta pinodes*) (Figs. 2 and 3) on field pea. The survey was conducted from August 10 to 14, 2001 when plants were at growth stage 208 to 301 (Knott, 1987). For each field, five points were sampled in a W-shaped pattern with approximately 5m between consecutive points. Ten plants were collected from each sampling point and assessed for powdery mildew and ascochyta blight according to symptoms on the leaves and stems. Disease severity was recorded as percent leaf area or stem portion covered with the respective symptoms. For both diseases, the upper and lower halves of the plants were assessed separately and an average value was calculated for the whole plant.

RESULTS AND COMMENTS: Powdery mildew and ascochyta blight were found at all the sites surveyed. Disease incidence (percentage of plants affected) was 100% in 19 locations for powdery mildew, 34 locations for ascochyta foliar blight and 35 locations for ascochyta stem blight.

Powdery mildew: Mean disease severity was less than 20% at 15 locations, between 21% and 50% at 8 locations and greater than 50% at 19 locations. Severity tended to be greater toward the Saskatchewan boundary, east of Vermilion, Wainwright and Provost, where temperatures are usually higher, and in the area north of Edmonton (Fig. 1) where there was more rainfall. The disease was less severe in a triangular area bounded by Vegreville, Camrose and Wainwright. Both lower relative humidity and temperature in this area may have restricted disease development.

Ascochyta blight: Ascochyta blight was commonly observed on both leaves and stems throughout the area, but was more severe in the area west of St. Paul (Figs. 2 and 3). Mean severity on leaves was less than 20% at 19 locations, between 21% and 50% at 8 locations, and greater than 50% at 15 locations. Mean severity on stems was less than 20% at 20 locations and between 21% and 50% at 22 locations. Leaf blight and stem blight shared a similar distribution pattern, so a relationship between ascochyta blight on leaves and stems was simulated with a sigmoid model (R^2=0.81, n=42) (Fig. 4), which more closely fit the data than linear, logistic and Weibull models. Wallen (1965) observed that ascochyta blight can be caused by three species. The relationship observed in this survey may either result from the same pathogen causing both leaf and stem blight, or the weather favouring different pathogens, which may cause leaf and stem blight independently.

REFERENCES:
1. Knott, C. M. 1987. A key for stages of development of the pea (*Pisum sativum*). Ann. Appl. Biol. 111:233-244.
2. Wallen, V.R. 1965. Field evaluation and the importance of the ascochyta complex on pea. Can. J. Plant Sci. 45:27-33.

ACKNOWLEDGEMENT:
The authors gratefully thank the Alberta Agricultural Research Institute and Alberta Pulse Growers Commission for funding the project and Rhonda Ovenden, Danielle Lamoureux and Tamara Gilbertson for their assistance in the field survey and data handling.

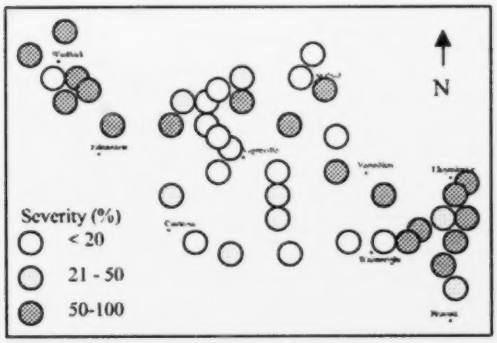

Fig 1. Powdery mildew severity on leaves of pea in central Alberta in 2001

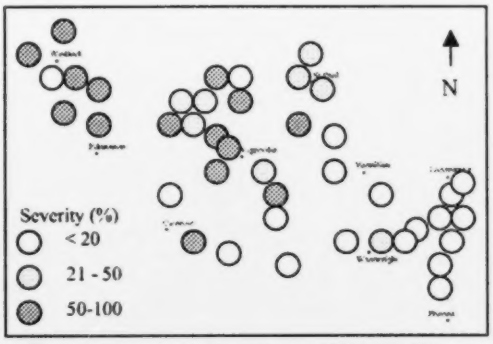

Fig 2. Severity of ascochyta blight on leaves of pea in central Alberta in 2001

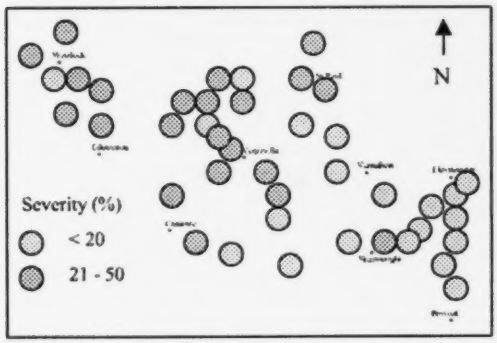

Fig 3. Severity of ascochyta blight on stems of pea in central Alberta in 2001

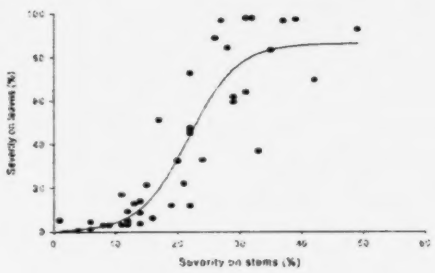

Fig 4. Relationship between severity of ascochyta blight on stems and leaves of pea in central Alberta in 2001

CROP: Dry bean
LOCATION: Manitoba

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TITLE: **DISEASES OF DRY BEAN IN MANITOBA IN 2001**

METHODS: Fields of dry bean were surveyed for root diseases at 37 locations and for foliar diseases at 59 locations in Manitoba. The survey for root diseases was conducted in the last week of June when plants were at the first trifoliate stage and for foliar diseases in the third week of August when the plants were at the pod-fill to early maturity stages. The fields surveyed were chosen at random from regions in southeast and south-central Manitoba, where most dry bean is grown. Ten plants were sampled at each of three random sites for each field surveyed. Diseases were identified by symptoms. Root diseases were rated on a 0 (no disease) to 9 (death of plant, the seedling did not emerge or died back quickly after emergence) scale. The severity of foliar diseases observed was estimated using a scale of 0 (no disease) to 5 (whole roots/plants were severely diseased). Anthracnose was rated as a percentage of plants infected. Five to 10 roots with disease symptoms per field were collected for fungal isolation in the laboratory in order to confirm the visual assessment.

RESULTS AND COMMENTS: In late June, two major root diseases were observed (Table 1). Fusarium root rot (*Fusarium solani* f. sp. *phaseoli*) and rhizoctonia root rot (*Rhizoctonia solani*) were the most prevalent diseases and observed in 31 and 19 of the 37 fields surveyed, respectively. Other diseases including anthracnose, fusarium wilt and ascochyta leaf spot were observed, however, their incidence was very low.

In August four foliar diseases were observed (Table 2). Bacterial blights (*Xanthomonas campestris* pv. *phaseoli* and *Pseudomonas syringae* pv. *phaseolicola*) and anthracnose (*Colletotrichum lindemuthianum*) were the most prevalent diseases and were observed in 57 and 54 of the fields surveyed, respectively. Rust (*Uromyces appendiculatus*) was observed in 17 fields, but generally was not severe. White mold (*Sclerotinia sclerotiorum*) developed late in the growing season and was common throughout the bean growing area.

Table 1. Prevalence and severity of diseases of dry bean 37 fields in Manitoba in June 2001.

Disease	No. fields affected	Disease Severity	
		Mean*	Range
Fusarium root rot	31	1.7	0.3-3.0
Rhizoctonia root rot	19	1.7	0.3-3.0
Anthracnose	7	1.8	0.8-2.9
Fusarium wilt	5	1.8	0.9-3.3
Ascochyta leaf spot	2	1.5	0.9-2.1

* Mean values are based only on fields where the disease was present.

Table 2. Prevalence and severity of diseases in 59 fields of dry bean in Manitoba in August 2001.

Disease	No. fields affected	Disease Severity*	
		Mean	Range
Bacterial Blights	57	2.2	1-4
Anthracnose	54	5.4	1-50
Fusarium wilt	25	1.6	1-3
Rust	17	2	1-4

* Anthracnose was rated as percentage of plants infected; other diseases were rated on a scale of 0 (no disease) to 5 (whole plant severely diseased). Mean values are based only on fields where the disease was present.

CROP: Field pea
LOCATION: Manitoba

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TITLE: **DISEASES OF FIELD PEA IN MANITOBA IN 2001**

METHODS: Crops of field pea were surveyed at 29 different locations in Manitoba for both root and foliar diseases. The survey for root diseases was conducted in the last week of June when the plants were at the six nodes to early flowering stages and for foliar diseases in the last week of July when the plants were at the pod-fill to early maturity stages. The crops surveyed were chosen at random from regions in southwest and south-central Manitoba, where most field pea is grown. Ten plants were sampled for each crop surveyed. Diseases were identified by symptoms. Root diseases were rated on a 0 (no disease) to 9 (death of plant, the seedling could not emerge or died back quickly after emergence) scale. White mold was rated as a percentage of plants infected. The severity of foliar diseases observed was estimated using a scale of 0 (no disease) to 9 (whole roots/plants were severely diseased). Five to 10 roots with disease symptoms per field were collected for isolation of fungi in the laboratory in order to confirm the visual assessment.

RESULTS AND COMMENTS: Four diseases were observed in the early disease survey (Table 1). Fusarium root rot (*Fusarium solani* f. sp. *pisi*) was the most prevalent root disease and was observed in 22 of the 29 fields surveyed. Fusarium wilt (*Fusarium oxysporum* f. sp. *pisi*) and rhizoctonia root rot (*Rhizoctonia solani*) were detected in a number of fields. Later in the growing season, mycosphaerella blight (*Mycosphaerella pinodes*), fusarium wilt and powdery mildew (*Erysiphe pisi*) were widespread and observed in 28, 10 and 8 of the 29 fields surveyed, respectively. Other foliar diseases were observed, but their incidence was very low.

Table 1. Prevalence and severity of root diseases in 29 crops of field pea in Manitoba in June 2001.

Disease	No. fields affected	Disease Severity (0-9)*	
		Mean	Range
Fusarium root rot	22	2.3	0.3-4.2
Fusarium wilt	9	2.2	0.8-4.2
Rhizoctonia root rot	6	2.1	0.8-3.5
Mycosphaerella blight	3	1.6	1.2-2.3

* All diseases were rated on a scale of 0 (no disease) to 9 (whole roots severely diseased). Mean values are based only on fields where the disease was present.

Table 2. Prevalence and severity of foliar diseases in 29 crops of field pea in Manitoba in July 2001.

Disease	No. fields affected	Disease Severity*	
		Mean	Range
Mycosphaerella blight	28	3.6	1-8
Fusarium wilt	10	4.5	3-7
Powdery mildew	8	1.9	1-4
Bacterial blight	2	3.2	3-3.5
Sclerotinia stem rot	1	5	5

* Sclerotinia rot was rated as percentage of plants infected; other diseases were rated on a scale of 0 (no disease) to 9 (whole plant severely diseased). Mean values are based only on fields where the disease was present.

Vegetables / Légumes

CROP: Potato
LOCATION: Canada

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TITLE: **CROSS-CANADA POTATO LATE BLIGHT SURVEY IN 2000**

METHODS: In 2000, 213 samples of potato and tomato suspected of having late blight were received from eight provinces. Isolates of *Phytophthora infestans* (de Bary) were prepared in pure culture and studied for mating type and metalaxyl sensitivity, according to Peters (4) and Peters et al. (5), and glucose phosphate isomerase (GPI) allozyme patterns according to Goodwin et al. (3). Metalaxyl sensitivity was based on 100 µg/ml metalaxyl in the medium, according to Peters (4).

RESULTS: The number of samples suspected of having late blight was considerably more than the 93 samples received in 1999 (2) but less than the 340 received in 1998 (1). The pathogen was successfully recovered from 162 of the 189 potato samples and from 23 of the 24 tomato samples. The recovery of active *P. infestans* from the samples was 89%, which was higher than in 1999 (75%), 1998 (81%), and 1997 (60%). Many of the samples received were also infected by other fungi such as *Verticillium, Alternaria, Botrytis, Fusarium*, or *Rhizoctonia*. Although late blight was reported on tomato and/or potato in all 10 provinces, samples were received from only 8 provinces. All isolates of the late blight pathogen obtained from potato and tomato samples were characterized using GPI allozyme banding patterns and previously identified GPI-genotyping standards.

The A2 mating type was found in all Canadian provinces from which infected samples were received and represented 91% of the isolates obtained versus 9% for the A1 mating type (Table 1). Of the A2 mating types, 93% were from potato and 7% were from tomato. For the A1 mating type, 33% were from potato and 66% were from tomato. For the potato samples, 3 provinces had the A1 mating type while 7 had the A2 mating type. However, only 2 provinces had both A1 and A2 mating types on potato. For the tomato samples, 4 provinces had the A1 mating type while 3 had the A2 mating type. However, only one province had both A1 and A2 mating types on tomato.

For samples from which the pathogen was obtained, no isolates with sensitivity to the fungicide metalaxyl were identified (Table 1). However, 98% of the samples had metalaxyl-moderately resistant (MMR) isolates and only 2% had metalaxyl-highly resistant (MHR) isolates. Among the potato samples, 99% were metalaxyl-moderately resistant and 1% were metalaxyl-highly resistant while all of the tomato samples were metalaxyl-moderately resistant. Metalaxyl-moderately resistant isolates were obtained from 8 different provinces and from both potato or tomato samples in 7 provinces. Metalaxyl-highly resistant isolates were obtained only from potato and in only two provinces. Two provinces had both metalaxyl-moderately resistant and metalaxyl-highly resistant isolates.

The previously reported GPI-genotypes, US-8 and US-11, were found in Canada representing 80% and 2%, respectively, of the pathogen population assessed in 2000 (Table 2). In addition, two other previously recognized genotypes, US-6 and US-14, were identified which represented 6% and 2%, respectively, of the population assessed. Also 10% of the samples yielded new, previously unknown GPI-genotypes. In addition to the unknown GPI-genotypes, the occurrences of US-6, US-11, and US-14 were new findings for some provinces in Canada.

Potato samples had US-6, US-8, US-11, and US-14 present in 2, 85, 1, and 2%, respectively, of the pathogen populations and were found in 2, 7, 2, and 2 provinces, respectively (Table 2). For tomato samples, US-6, US-8, US-11, and US-14 occurred respectively in 35, 48, 9, and 0% of the pathogen populations and were found in 3, 5, 1, and 0 provinces, respectively. The unknown GPI-genotypes were found on potato samples from 4 provinces, on tomato samples from 3 provinces, and on both potato and tomato samples from 3 provinces. Among the unknown genotypes obtained, 87% were obtained from potato and 13% from tomato.

Variation continues to occur in *P. infestans* populations causing potato late blight in Canada, especially in terms of new pathogen genotypes. The cause of the changing nature of the pathogen populations and their impact on disease and its control require further study. Of particular disease risk is the occurrence of both mating types in at least five provinces, which means that sexual reproduction in addition to importation could be active in the development of new, more aggressive pathogen genotypes and increased disease threat due to oospores.

More tomato samples were sent in 2000 than previously and many had a very aggressive US-6 GPI-genotype. Obviously, this host can be a potential source of disease for potato and it is important to monitor tomato late blight occurrence in crops and home gardens across Canada. In addition to infected seed tubers, volunteer plants and cull piles acted as major sources of air-borne inoculum, and incidences of late blight on 'nightshade' weeds along field borders were also reported.

This work was the final year of the multi-year Cross-Canada late blight project funded by Agriculture and Agri-food Canada and 18 potato industries and associations (Cavendish Farms, PEI Potato Board, NS Potato Marketing Board, NB Potato Agency, Federation des Producteurs de Pomme de Terre de QC, ON Potato Growers Marketing Board, Keystone Vegetables Producers, SK Seed Potato Growers Association, The Potato Growers of AB, BC Vegetable Marketing Commission, Hoechst/Agrevo Inc., BASF Canada Inc., Cyanamid/Wyeth-Ayerst Canada Inc., Dupont Canada, ISK Biosciences Ltd, Novartis Canada Ltd., Rohm and Haas Canada Inc., Zeneca Agro.) under the Matching Investment Initiative Program (#7001).

REFERENCES:

1. Daayf, F. and Platt, H. W. 2000. Canadian potato late blight survey in 1998. Can. Plant Dis. Surv. 80: 118-120.
2. Daayf, F. and Platt, H. W. 2000. Cross-Canada potato late blight survey in 1999. Can. Plant Dis. Surv. 81: 141-143.
3. Goodwin, S. B., Schneider, R. E., and Fry, W. E. 1995. Use of cellulose-acetate electrophoresis for rapid identification of allozyme genotype of *Phytophthora infestans*. Plant Dis. 79: 1181-1185.
4. Peters, R. D. 1998. Characterization of evolving populations of *Phytophthora infestans* causing late blight of potato in Canada. Ph.D. thesis, The University of Guelph, ON, Canada.
5. Peters, R. D., Platt, H. W., and Hall, R. 1998. Long-term survival of *Phytophthora infestans* on liquid media prepared from autoclaved seeds. Can. J. Plant Pathol. 20:165-170.

Table 1. Crop samples submitted for late blight pathogen population determinations in 2000.

	Potato		Tomato		Total	
	# Samples	# Provinces	# Samples	# Provinces	# Samples	# Provinces
Mating Type						
A1	5	3	10	4	15	5
A2	138	7	11	5	149	8
Metalaxyl Sensitivity*						
MS	0	0	0	0	0	0
MMR	141	7	19	7	161	8
MHR	2	2	2	1	3	2

*MS = metalaxyl sensitive; MMR = metalaxyl-moderately resistant; MHR = metalaxyl-highly resistant

Table 2. Glucose phosphate isomerase (GPI) banding pattern genotype characterization of pathogen isolates obtained from potato and tomato samples received in 2000

	GPI-genotype				
	US-6	US-8	US-11	US-14	UN*
Potato					
# Samples	3	137	2	3	20
# Provinces	2	7	2	2	4
Tomato					
# Samples	8	11	2	0	3
# Provinces	3	5	1	0	3
Total					
# Samples	11	148	4	3	23
# Provinces	4	8	2	2	4

*UN = GPI banding patterns not recognized under previously established GPI-genotype characterizations.

Fruit, Nuts and Berries, Ornamentals and Turfgrass,/ Fruits, fruits à écale, et baies, plantes ornementales et gazon

CROPS: Apples, pears, peaches (fresh and cling), nectarines, cherries (tart and sweet), plums (European and Japanese), apricots
LOCATION: Niagara Peninsula, Ontario

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TITLE: **DISEASES OF TREE FRUIT IN THE NIAGARA PENINSULA, ONTARIO, 2001**

METHODS: Approximately 800 ha of tree fruit were monitored weekly within the Niagara peninsula from 30 April to 31 August 2001. This included 105 blocks of peaches at 62 locations (490 ha), 38 blocks of other tender fruit (plums, cherries, nectarines, apricots) at 31 locations (110 ha), 53 blocks of pears at 46 locations (120 ha), and 21 blocks of apples at 12 locations (80 ha).

RESULTS AND COMMENTS: Due to extremely dry conditions in 2001, disease pressure in tree fruit overall was not as high as usual in most orchards. Less than 5% crop loss occurred from diseases.

Tender Fruit
Brown rot, caused by *Monilinia fructicola*, was found in 16 blocks of peaches and 5 blocks of plums. Fruit infections were found once ripening was initiated from late July to early August. No symptoms of blossom blight were observed in any orchards. Peach leaf curl, caused by *Taphrina deformans*, was found on initial growth in 11 peach blocks. Powdery mildew, caused *by Sphaerotheca pannosa*, was found on fruit in 10 peach blocks at pit hardening. Bacterial spot, caused by *Xanthomonas campestris* pv. *pruni* was found in 6 cling peach blocks at pit hardening.

Pome Fruit
Scab, caused by *Venturia inaequalis*, was found in 16 blocks of apples before bloom. In pears, scab caused by *Venturia pirina*, was found in 5 blocks after bloom. Powdery mildew, caused by *Podosphaera leucotricha*, was found in shoot terminals in 17 blocks of apple cv. Idared but no netting was observed on fruit. Shoot blight symptoms of fireblight, caused by *Erwinia amylovora*, were observed in 2 blocks of apples, cv. Idared and 15 blocks of pears cv. Bartlett following 5 mm of rain at bloom.

CROP: Grapes
LOCATION: Niagara Peninsula, Ontario

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TITLE: **DISEASES OF GRAPES IN ONTARIO, 2001**

METHODS: Approximately 1,360 ha of grapes were monitored weekly from 30 April to 31 August 2001. This area was comprised of 368 blocks at over 110 farm locations covering the entire Niagara peninsula. Labrusca (*Vitis labrusca*) cultivars (juice and fresh market), French hybrids and vinifera (*V. vinifera*) cultivars (for wine) were monitored for pest activity, crop phenology, crop load estimations and overall plant health weekly. Fruit sampling for harvest indices and pest activity continued through to harvest (25 October 2001) at approximately 225 ha each week.

The pests/indicators are listed below along with the number of separate blocks that had measurable injury from the identified agent at some point during the growing season. Approximately half of the monitored blocks used overhead irrigation.

RESULTS AND COMMENTS: Due to extremely dry conditions in 2001, disease pressure in grapes overall was not as high as usual in most vineyards. Less than 5% crop loss occurred from diseases. However, considering the very dry weather during the growing season, there was a surprising amount of disease detected.

Phomopsis cane and leaf spot caused by *Phomopsis viticola* was found early in the season (before bloom) in 34 of the blocks monitored (primarily on *V. labrusca* cv. Niagara and French hybrid cv. DeChaunac).

Botrytis bunch rot caused by *Botrytis cinerea* was found in 34 blocks, predominantly when overhead irrigation was applied after fruit set and prior to cluster closure (01 July and 09 August) on *V. vinifera* cultivars. Symptoms of bunch rot were noticed predominantly after the second irrigation application in late July, although some symptoms were noticed after initial irrigation in mid July. Most severely affected were *V. vinifera* cvs. Riesling, Pinot Noir, Chardonnay and Gewurtztraminer.

Downy mildew caused by *Plasmopara viticola* was found in 15 blocks (8 *V. vinifera* and 7 *V. labrusca* blocks) and black rot caused *Guignardia bidwellii* was found in 9 blocks (6 *V. vinifera* and 3 *V. labrusca* blocks).

Although powdery mildew (*Uncinula necator*) was expected to be a problem following the epidemic in 2000, it was found only late in the season, after veraison, in 27 *V. vinifera* blocks, with cv. Chardonnay comprising 15 of the infected blocks.

CROP: Apple
LOCATION: British Columbia

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TITLE: POSTHARVEST DECAY OF STORED APPLES IN BRITISH COLUMBIA IN 1999

INTRODUCTION: Almost half of the apples harvested from British Columbia's primary apple growing areas of the Okanagan and Similkameen Valleys are placed in large cold storage rooms located at seven major packinghouses. Apples are removed from cold storage throughout the winter and spring and packed. Fruit destined to be kept the longest is put into controlled atmosphere (CA) storage where temperature, oxygen, and carbon dioxide air concentration are rigorously controlled. The apple industry in British Columbia through the Okanagan Federated Shippers Association (OFSA) maintains a research program that has responsibility for determining optimum storage conditions for each apple cultivar. For example, in the last storage year, information was required on storage atmospheres for 'Braeburn' and 'McIntosh' apples, and storability of the promising new 'Ambrosia' cultivar. In cooperation with OFSA apples were surveyed from the various growing areas for postharvest decay. Usually the decay is caused by either *Penicillium* spp. or *Botrytis cinerea*, as we found in an earlier survey on rotten fruit from three packinghouses (Sholberg and Haag, 1995). Among the *Penicillium* spp., *P. expansum* is the most common comprising about 80% of the isolates. *Penicillium solitum* is likely the second most important species although it is considered a weak pathogen of apple compared to *P. expansum*. *Penicillium* spp. cause the postharvest disease known as blue mold where conidia from decayed fruit infect wounds during harvest and handling (Sholberg, 2000). *Botrytis cinerea* causes the postharvest disease known as gray mold. Similarly, conidia of *B. cinerea* infect wounds or injuries on apples during harvest and handling of fruit going into storage (Sholberg, 2000). Therefore, all postharvest decays are much more common on injured fruit.

METHODS: Braeburn apples (130 per location) were harvested at commercial maturity in late October, 1998 from orchards near Vernon and Kelowna of the Northern Okanagan Valley and near Summerland, Oliver, and Osoyoos of the Southern Okanagan Valley. McIntosh apples (130 per location) were similarly harvested in mid September, 1998 from Northern Okanagan orchards located in the Oyama, Winfield and Kelowna areas. Ambrosia apples (130 per location) were similarly harvested in early October, 1998 from Summerland and Cawston in the Similkameen Valley. The apples were picked by employees of OFSA and immediately brought to the Pacific Agri-food Research Centre (PARC), Summerland for storage. Half the apples were placed in air storage at 0•C (65 per location), and the other half (65 per location) were placed in rigorously controlled atmosphere storage chambers. Controlled atmosphere treatments were at 0•C, but with varying oxygen and carbon dioxide conditions. After 3 to 9 months of storage, the fruit were examined for postharvest decay. Isolations were made from apples that appeared to be infected by *Penicillium* spp. and where the causal organism was in doubt. Isolations were made by removing the fruit skin from the margin of a lesion and aseptically placing bits of decayed tissue on petri plates containing potato dextrose agar. After incubation at 20•C for 5 to 14 days, isolates were identified based on colony morphology and spore characteristics.

RESULTS: 'Braeburn' apples were susceptible to postharvest decay in 1999 with 14.7% decay in air storage when data for all areas were combined (Table 1). Controlled atmosphere storage of 'Braeburn' reduced decay 4% after 6 months storage. *Penicillium* spp. were the most important cause of decay in air and CA storage causing roughly 17 and 4 times as much decay, respectively, as *B. cinerea*. 'Braeburn' apples from the more northern apple growing areas in Vernon and Kelowna were more

resistant to postharvest decay in CA storage than those from the more southern areas of Summerland, Oliver, and Osoyoos. 'McIntosh' apples stored in air and CA only started to decay after storage for 3 months (Table 2). The apples harvested in the North Okanagan were generally more resistant to decay especially those in CA storage. Surprisingly, 'McIntosh' apples from the Kelowna area stored in CA suffered the highest amount of decay after 9 months. 'Ambrosia' apples stored for more than 3 months were extremely prone to decay by *Penicillium* spp. (Table 3). Decay by *B. cinerea* was generally much lower. It appeared that both CA storage regimens reduced decay by *Penicillium* spp. in fruit stored for 9 months.

DISCUSSION: It was clear from this survey that postharvest decay was a significant problem in apples stored from fall 1998 to spring 1999. CA storage was very important in reducing losses of 'Braeburn' and 'McIntosh' apples stored for 6 months, and 'Ambrosia' apples stored for 9 months. 'Braeburn' was less prone to decay if grown in more northern regions, but unfortunately it does not always reach maturity in these areas. 'McIntosh' from the North Okanagan was less susceptible to decay for unknown reasons. It could be related to maturity or possibly a higher level of calcium (Conway and Sams, 1985). Calcium will reduce decay caused by *Penicillium* spp. 'Ambrosia' was very susceptible to decay in storage especially by *Penicillium* spp. It is not clear from this study why this cultivar was so susceptible, and further research will be needed before this question can be answered.

REFERENCES

1. Conway, W.S., and C.E. Sams. 1985. Influence of fruit maturity on the effect of postharvest calcium treatment on decay of Golden Delicious apples. Plant Dis. 69:42-44.
2. Sholberg, P.L., and P.D. Haag. 1996. Incidence of postharvest pathogens of stored apples in British Columbia. Can. J. Plant Pathol. 18:81-85.
3. Sholberg, P.L. 2000. Postharvest handling of pome fruits, soft fruits, and grapes. Agriculture & Agri-Food Canada Publication 1768E. Revised as an electronic publication: http:.//res2.agr.ca/parc-crapac/ english/3electronic_publications/phhandbook/default.htm.

Table 1. Postharvest decay of 'Braeburn' apples stored for 4 and 6 months in air or CA.

Location and number of sites[1]	Pathogen	Percent apples decayed in storage			
		Air[2] 4 months	CA[3] 4 months	Air 6 months	CA 6 months
Vernon, B.C. Area (3 sites)	*Botrytis cinerea*	0.4	0.2	0.2	0.6
	Penicillium spp.	0.6	0.3	3.8	1
	Combined	1	0.5	4	1.6
Kelowna, B.C. Area (5 sites)	*B. cinerea*	0.1	0	0	0.7
	Penicillium spp.	0.2	0	0.9	1
	Combined	0.3	0	0.9	1.7
Summerland, B.C. Area (6 sites)	*B. cinerea*	0.4	0.3	0.6	0.3
	Penicillium spp.	0.7	1.4	4.5	4.8
	Combined	1.1	1.7	5.1	5.1
Oliver and Osoyoos, B.C. Areas (3 sites)	*B. cinerea*	0.7	1.5	0	0.4
	Penicillium spp.	0.8	1.9	4.7	2.1
	Combined	1.5	3.4	4.7	2.5
All sites combined (17 sites; 1,105 apples)	*B. cinerea*	1.6	2	0.8	2
	Penicillium spp.	2.3	3.6	13.9	8.9
	Combined	3.9	5.6	14.7	10.9

[1] Number of sites refers to the number of locations where 130 apples were harvested per location and separated into lots of 65 for each storage regime.

[2] Air storage was at 0• C with 21.0% oxygen and 0.2% carbon dioxide.

[3] CA storage was at 0• C with 1.5% oxygen and 1.2% carbon dioxide.

Table 2. Postharvest decay of 'McIntosh' apples stored for 3, 6 and 9 months.

Location and number of sites[1]	Pathogen	% Decay after 3 months		% Decay after 6 months		% Decay after 9 months	
		Air[2]	CA[3]	Air	CA	Air	CA
North Okanagan area (Oyama and Winfield, 3 sites)	*B. cinerea*	0	0	2	0	0	0
	Penicillium spp.	0	0	3.5	0	0.8	0.8
	Combined	0	0	5.5	0	0.8	0.8
Kelowna and Westbank area (3 sites)	*B. cinerea*	0	0	8.3	1.1	1.8	4.7
	Penicillium spp.	0	0	0	2.2	5.4	4.8
	Combined	0	0	8.3	3.3	7.2	9.5
All sites combined (6 sites; 390 apples)	*B. cinerea*	0	0	10.3	1.1	1.8	4.7
	Penicillium spp.	0	0	3.5	2.2	6.2	4.8
	Combined	0	0	13.8	3.3	8	9.5

1 Number of sites refers to the number of locations where apples were harvested and separated into lots of 65 apples for each storage regime and duration.
2 Air storage was at 0•C with 21.0% oxygen and 0.2% carbon dioxide.
3 CA storage was at 0•C with 2.5% oxygen and 5.0% carbon dioxide.

Table 3. Postharvest decay of 'Ambrosia' apples stored for 3, 6, and 9 months at 3 storage regimens.

Location and number of sites[1]	Pathogen	%Decay after 3 months			% Decay after 6 months			% Decay after 9 months		
		Air[2]	CA1[3]	CA2[4]	Air	CA1	CA2	Air	CA1	CA2
Cawston area (1 site)	*B. cinerea*	0.8	0.8	0.8	2	3	0	0.8	3.4	0
	Penicillium spp.	1	3	1	2	24.4	22	72.6	16.7	22.4
	Combined	1.8	3.8	1.8	4	27.4	22	73.4	20.1	22.4
Central Okanagan Summerland (3 sites)	*B. cinerea*	2.7	2.3	2.3	1.7	2.4	0.3	0.6	4.1	3.9
	Penicillium spp.	0.3	1.7	1.7	10.9	7	6	10	6.9	6.9
	Combined	3	4	4	12.6	9.4	6.3	10.6	11	10.8
All sites combined (4 sites; 260 apples)	*B. cinerea*	3.5	3.1	3.1	3.7	5.4	0.3	1.4	7.5	3.9
	Penicillium spp.	1.3	4.7	2.7	12.9	31.4	28	82.6	23.6	29.3
	Combined	4.8	7.8	5.8	16.6	36.8	28.3	84	31.1	33.2

[1] Number of sites refers to the number of locations where apples were harvested and separated into lots of 65 apples for each storage regime and duration.
[2] Air storage was at 0• C with 21.0% oxygen and 0.2% carbon dioxide.
[3] CA1storage was at 0• C with 1.2% oxygen and 1.5% carbon dioxide.
[4] CA2 storage was at 0• C with 0.7% oxygen and 1.5% carbon dioxide.

Forest trees/ Arbres forestiers

CROP: Western Hemlock
LOCATION: British Columbia

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TITLE: **INCIDENCE OF HEMLOCK DWARF MISTLETOE IN VARIABLE RETENTION CUTBLOCKS IN THE LONG BEACH MODEL FOREST**

INTRODUCTION: Hemlock dwarf mistletoe, Arceuthobium tsugense (Rosendahl) G.N. Jones, a parasitic plant indigenous to the Pacific Northwest (1), is found throughout the Long Beach Model Forest area on western hemlock (Tsuga heterophylla (Raf.) Sarg.) and amabilis fir (Abies amabilis Dougl. ex Forbes). The effects of dwarf mistletoe infection include abnormal branch and stem swellings, branch proliferation, stunting of tree growth, and, in severe cases, tree death (2).

Over >95% of dwarf mistletoe seed is dispersed within 10 m of the source infection (3) which tends to result in clumped distributions, with infections radiating out from the point of initial infection (4). Dwarf mistletoe spread is fastest in multi-storied, open stands (5, 6, 7). When an area with dwarf mistletoe is disturbed, either through fire, windthrow events, or forestry activities, there is an increased likelihood of intensified dwarf mistletoe infection and spread (1, 8). The exception to this is clearcut silviculture which is widely recognized as an effective means of eliminating dwarf mistletoe from an area (1, 8). In contrast, variable retention silviculture could result in an epidemic of hemlock dwarf mistletoe. Variable retention silviculture has the objective to preserve characteristics of the natural forests (9) by leaving various amounts of standing trees that retain structural features of the forest after harvesting (10). In variable retention openings, a large proportion of second growth hemlocks may be exposed to dwarf mistletoe seed falling from heights greater than 20 m overhead. Dwarf mistletoe infested second growth is a possibility considering that 75% of trees within 10 m of an infected retained overstory tree can be infected within 25 years of harvest (11), and that 25 well-dispersed infected retained trees per ha can result in infection of all new and existing trees (3).

METHODS: Twenty-five harvest units in 10 International Forest Products' variable retention cutblocks in the Long Beach Model Forest area (49• N, 125• W), on the west coast of Vancouver Island, British Columbia were surveyed for hemlock dwarf mistletoe in 2001. The blocks were harvested between 1996 and 1999 with harvest units in four harvest patterns: clearcut, patch cut, strip cut, and dispersed retention. For the purposes of this survey, clearcuts were defined as openings greater than 1 ha in size, broader than two mature tree lengths and with <15% interior retention. Patch cuts were openings 1 ha or less in size. Strip cuts were openings less than two times the height of adjacent mature trees in width. Dispersed retention was defined as openings with >15% interior retention. Within the 10 cutblocks, seven clearcut harvest units, six patch cut harvest units, seven strip cut harvest units and five dispersed retention harvest units were surveyed for a total surveyed area of 39 ha. Cutblock retention levels ranged from 17% to 64% and dispersed harvest unit retention ranged from 28% to 83%.

A ground-based walk-through survey was used to identify dwarf mistletoe brooms, branch swellings, stem swellings and shoots. All edge and dispersed retained trees were examined in each surveyed area. The location of each infected tree was recorded on a map of the cut block. I examined windthrow trees for infections and rated as obvious or not obvious based on whether or not it was likely that the dwarf mistletoe infection would be seen if the tree were still standing. This information was gathered to test whether or not the survey techniques could be underestimating the level of dwarf mistletoe in the stand.

I calculated the number of infected trees per ha in each harvest unit by dividing the total number of infected trees by the total area surveyed. I calculated infestation area as the percent of the harvest unit within 10 m of infected trees and plotted % infestation area against regeneration area for each harvest unit. Regeneration area was equivalent to the harvest unit area except for dispersed retention harvest units. Regeneration areas for the dispersed retention units were calculated by multiplying the harvest unit area by the percentage of the block that was harvested (100% – retention level %). The length of the surveyed edge was determined for the patch cut, strip cut and clearcut harvest units and I plotted the absolute infestation area against the length of edge for these harvest units.

RESULTS: The number of infected trees/ha ranged from 0 and 2 to 54 and 89 (Table 1). Harvest units with regeneration areas >1 ha did not have infestation areas greater than 27% (Fig. 1). Harvest units with smaller regeneration areas (<1 ha) had extremely variable infestation areas (0% to 86%). Dispersed retention harvest units of different sizes had relatively constant infestation areas overall: the number of infected trees per ha and infestation area did not increase or decrease as retention level increased. As the proportion of opening size to length of edge increased, the maximum % infestation area decreased, with a wide range of infestation areas below the maximum (Fig. 2).

Stand species composition and pre-harvest dwarf mistletoe distribution interacted with harvest pattern to affect the infestation area within harvest units. In the clearcuts, within-block reserves with dwarf mistletoe infected trees increased the area influenced by hemlock dwarf mistletoe seed. The patch cuts exhibited a wide range of infestation areas (0% to 67%). The two smallest patch cuts had the highest infestation areas (67% and 35%). The strip cuts in a heavily infested block with a high proportion of hemlock along the edges all had high infestation areas (54% and 86%). In a similarly infested block with higher amabilis fir retention there was only moderate evidence of dwarf mistletoe on the surveyed strip cut edges with an average infestation area of 12%. One cutblock that had moderate to high incidence of hemlock dwarf mistletoe, with an average infestation area of 57% for the other harvest units, had a dispersed retention harvest unit with a very low incidence of hemlock pre- and post-harvest (nearly 100% cedar cut and retention). Despite the absence of internal sources of dwarf mistletoe, the harvest unit still had an infestation area of 12.5% due to edge sources.

In two of the three blocks that had more than three infected windthrow trees identified, the majority of the identified trees had obvious signs of dwarf mistletoe. In the third block, of 13 infected windthrow trees, four had obvious signs of infection and nine had non-obvious swellings with shoots. The inclusion of all sources of dwarf mistletoe – including windthrow trees – added on average 1.3% to the infestation area with more than a 4 % increase in only one harvest unit.

COMMENTS: Variable retention harvest patterns can have a major impact on dwarf mistletoe incidence because of effects on the distribution of retained trees. In the clearcuts and patch cuts, infestation area decreased as a percentage of total regeneration area as the harvest size increased because much of the interior area of the cut patch was not exposed to infection sources. The relationship was not the same for strip cuts or dispersed retention. In strip cuts, edge increased at a linear rate as area increased, with the maximum % infestation area remaining constant. In dispersed retention, many edge trees and trees retained within the harvest opening were potential sources of infection. Maximum % infestation area was dependent on the ratio of edge to opening area, the level of retention and the distribution of retained trees.

I found that the smallest harvest openings had the highest and some of the lowest infestation areas and that the largest clearcut openings had low to moderate infestation areas. This can be partly explained by the effect of edge. As the opening area to edge ratio increased, infestation area decreased. Maximum % infestation area was determined by the harvest pattern because pattern determined the proportion of the block that was adjacent to the edge. Below the maximum level there was considerable variability. This variability can be explained by the incidence and distribution of dwarf mistletoe infected hemlocks within the retained stand that was directly influenced not only by harvest pattern but also by the pre-harvest dwarf mistletoe condition and post-harvest stand species composition. When non-host species

were retained along edges or dispersed throughout cut areas, infestation areas were low. Likewise, if the pre-harvest incidence of dwarf mistletoe was low then infestation area was low. There was no pronounced increase in infestation area with retention level in dispersed retention harvest units which can be explained by the uneven distribution of infected retention trees throughout the dispersed retention areas. It is important to note that these values for infestation area are short-term conservative values. New infections begin to produce seed after five years and after that time the area exposed to dwarf mistletoe seed will likely increase as the dwarf mistletoe radiates out from the initial infection centres.

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REFERENCES:

1. Hawksworth F.G. and Wiens D. 1996. Dwarf mistletoes: biology, pathology, and systematics. Agriculture Handbook 709, USDA, Forest Service, Washington, D.C. USA.
2. Baranyay J.A. and Smith R.B. 1972. Dwarf mistletoes in British Columbia and recommendations for their control. Report BC-X-72. Canadian Forestry Service, Pacific Forest Research Centre, Victoria, British Columbia. 18 p.
3. Smith R.B. 1966. Hemlock and larch mistletoe seed dispersal. Forestry Chronicle. 42:395-401.
4. Alfaro R. 1986. Survey and appraisal of dwarf mistletoe in second-growth western hemlock stands. In: Proceedings of a workshop on management of hemlock dwarf mistletoe 1983 August 15-16; Burnaby, BC. J. Muir (ed.). Pest Management Report 4. British Columbia Ministry of Forests, Victoria, British Columbia. 58 p.
5. Dekker-Robertson D., Griessmann P., Baumgartner D. and Hanley D. 2000. Forest Health Notes. Department of Natural Resource Sciences. (http://ext.nrs.wsu.edu/info/fhn/dwfmist.html)
6. United States Department of Agriculture. 2000. Forest Disease Management Notes. (http://www.fs.fed.us/r6/nr/fid/mgmtnote/)
7. Trummer L.M., Hennon P.E., Hanson E.M. and Muir P.S. 1998. Modeling the incidence and severity of hemlock dwarf mistletoe in 110-year-old wind-disturbed forests in Southeast Alaska. Can. J. For. Res. 28: 1501-1508.
8. Ministry of Forests. 1995. Forest Practices Guide: dwarf mistletoe management guide. Government of British Columbia. Victoria, B.C.
9. Clayoquot Sound Scientific Panel. 1995. Sustainable Ecosystem Management in Clayoquot Sound: Planning and Practices. Report 5. Victoria, British Columbia.
10. Interfor. 2001. Information Bulletin: New Harvesting Practices. (http://www.interfor.com/managing_our_forests/bulletins/sustain.html)
11. Stewart J.L. 1976. Dwarf mistletoe infection from residual western hemlock on cutover stands. USDA Research Note. PNW-278.

Table 1. Results summary table grouped by harvest pattern showing for each harvest unit the total area surveyed, regeneration area, the number of infected trees per ha, and the absolute and % infestation area (area within 10 m of hemlock dwarf mistletoe infection). Insufficient information was available to report LS16-2 regeneration area.

Harvest Pattern	Harvest Unit Name	Total Area Surveyed (ha)	Regeneration Area (ha)	Number of Infected Trees/ha	Infestation Area	% Infestation Area
Clearcut	LS16-1	2.3	2.7	19	0.53	22.5
	LS16-2	1.9	n/a	17	0.45	23.2
	LS16-3	2.3	2.4	4	0.19	8.1
	LS20-C	4.4	4.4	2	0.17	3.8
	LS20-E	2.0	2.8	0	0	0
	LS20-F	1.2	1.2	0	0	0
	R50-C	2.3	2.3	3	0.13	5.5
Patch Cut	UC5A-SE	0.8	0.8	6	0.09	10.4
	UC5A-SW	1.0	1.0	8	0.13	13.2
	LS13-II	2.0	2.0	13	0.52	25.4
	LS20-D	0.8	0.8	0	0	0
	R10-A	0.2	0.2	43	0.16	67
	R20-B2	0.6	0.6	18	0.20	34.7
Strip Cut	R20-B1	0.4	0.4	39	0.27	70.4
	R20-B2N	0.1	0.1	89	0.08	86.1
	R20-B2S	0.1	0.1	54	0.05	54.1
	V14-1	0.2	0.2	9	0.04	16
	V14-3	0.1	0.1	0	0.00	1.9
	V14-4	0.2	0.2	5	0.02	7.6
	V14-5	0.2	0.2	12	0.05	21.4
Dispersed Retention	UC5C	7.9	5.7	14	2.15	27.1
	LS10	4.9	3.0	10	1.29	26.2
	R20-B3	1.1	0.3	20	0.41	37.4
	R20-D	0.8	0.5	8	0.10	12.5
	V14-2	0.8	0.1	12	0.23	28.5

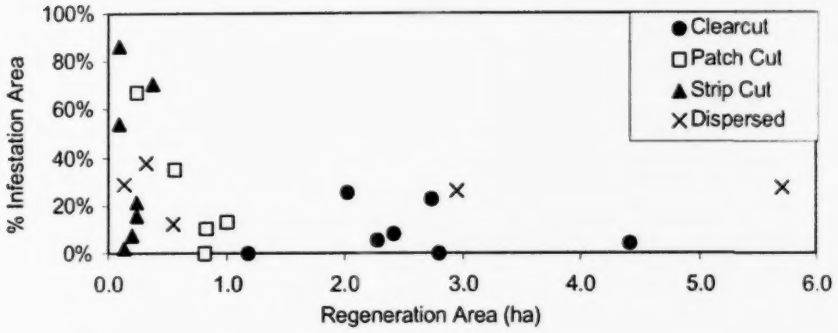

Figure 1. The % infestation area for each harvest unit plotted against the regeneration area in ha, by harvest pattern. Infestation area was the area within 10 m of dwarf mistletoe infected trees and regeneration area was the area of the harvest unit that had been harvested and was expected to regenerate trees.

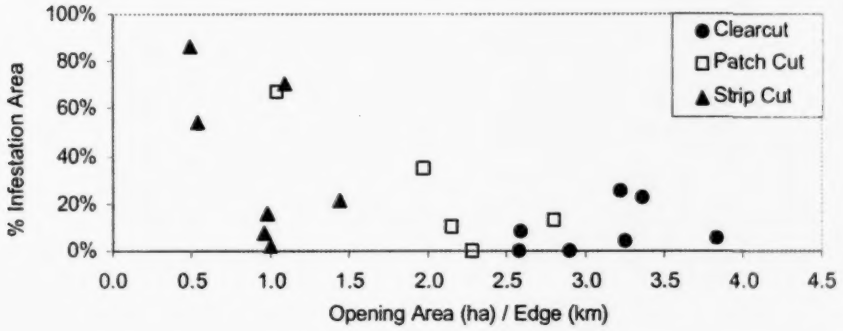

Figure 2. The % infestation area plotted against the ratio of opening area (ha) to the length of edge (m) for the clearcut, patch cut and strip cut harvest units.

CROP: Lodgepole pine (*Pinus contorta* Dougl. var *latifolia* Engelm.)
LOCATION: Southwestern Alberta

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TITLE: **SURVEY OF DWARF MISTLETOE (*ARCEUTHOBIUM AMERICANUM* NUTT. EX ENGELM.)**

INTRODUCTION AND METHODS: Dwarf mistletoe infestation in lodgepole pine forests in western North America is extensive and damaging (1, 5, 7). In forestry operations dwarf mistletoe is usually controlled by clear-cut harvesting blocks of • 20 ha, followed by eradication of infected residual trees (2, 5). Margins of blocks are usually located in uninfected stands to prevent re-invasion. However, there is often a concern about spread from margins, and the sanitation of margins or planting non-susceptible tree species have occasionally been recommended to prevent spread into cutblocks. In the United States at 25 to 30 years after harvest or fire, dwarf mistletoe infected 30% of young lodgepole pine within 10 to 15m of infected trees at margins (3, 4). In southwestern Alberta a survey in 1968 indicated less spread of dwarf mistletoe from infected margins and differences in infection adjacent to inoculum sources. Spread from residual trees into young trees was 7.8m from undisturbed residual stands and 13.3m from single, residual trees (6), a highly significant difference ($p = 0.01$, Student's t-test). However, data on dwarf mistletoe incidence and spread in young stands are still lacking.

(Editor's note: The continued importance and need to substantiate silvicultural control treatments for dwarf mistletoe prompted this report of 35-year old survey data from 1968.)

The survey area was a subalpine forest predominantly of lodgepole pine, 1500 to 2300m elevation, approximately 80km southwest of Calgary. The area was burned by wildfire in 1939, leaving scattered patches, clumps and single residual lodgepole pine trees, commonly infected by dwarf mistletoe. To characterize the forest area potentially or actually infected from residual trees, a 4.5km length of a forestry road running north-south through the area was established as a baseline. Parallel, line-intercept transects were run from starting points at 220m intervals that were randomly selected using a table of random numbers. At each selected point, a coin was tossed to determine the direction (due east or due west) for each transect. Nine transects 5.5m wide by approximately 1.2km long were run on each side of the road.

On each transect positions and distances were recorded for segments that intercepted residual and regenerating stands of trees, and openings. Any infected residual tree situated • 10m from a young tree on a transect was recorded as a potential source of infection. For each infection source encountered, the transect area occupied by infected young trees and "exposed" young trees, i.e., young trees within 10m of residual infected trees, was determined by measuring the distance along the transect from the first to the last young tree. All young trees on transects were examined for dwarf mistletoe infection. For all young infected trees found, the surrounding area within 50m was examined to determine the closest residual infected tree or trees that was the presumed source of infection. Transects also were used to randomly select single infected residual trees and residual stands to determine extent of spread into the young trees (6). Single-tree sources were defined as one or two mature, infected residual trees that were situated at least 100m or more from any other mature residual tree. Residual stands were defined as areas of mature infected trees • 30m x 30m. At several selected stands or single trees, a rectangular plot 5m x 15m was established to determine the percentage of young trees infected.

RESULTS: Approximately 1750ha were covered by the survey, with 10.3ha examined in the transects. Residual stands age 80 to 120 years occupied 10% of the area and young trees, 23 to 27 years age, occupied 70%. Only 2.1% of the total area of young trees were exposed to a potential infection source, i.e., situated within 10m of single trees or stands of residual infected trees. In most (1.3%) of this area, young trees were infected by dwarf mistletoe, but in a significant proportion (0.8%), the young trees did not have any signs of infection. Of the total area of young trees exposed, but apparently uninfected, most (84%) was adjacent to undisturbed infected residual stands, and 16% adjacent to single or scattered infected residual trees. Of the total area of young infected trees, 52% was closely associated with relatively dense, undisturbed stands of residual infected trees and 43% with single or scattered residuals. The remaining 5% of the area of young infected trees was not associated with any evident infection source. This infection might have been initiated by small infected residual trees that died and disappeared before the survey, or possibly, by long-distance spread of seed by birds.

In three plots established adjacent to residual stands, an average 14.5% of young trees were infected, with 2.7 infections per infected tree. However, further review indicated that two of these plots did not represent spread from undisturbed residual stands. One stand had been partially cut and the other had scattered residual trees in the regenerating area. In these two plots an average 19% of the young trees was infected, with 2.9 infections per infected tree. In the plot adjacent to an undisturbed residual stand, 5.6% of young trees were infected, with 1 infection per infected tree. In six plots established adjacent to single infected residuals, an average of 11% of young trees were infected, with 1.8 infections per infected tree.

Results of the survey indicated that dwarf mistletoe spread from infection sources in southwestern Alberta was much less than previously reported (3, 4) in the USA. Although almost 30 years had elapsed since the area had been burned by wildfire, only 2% of the area occupied by young trees had either infected young trees or was exposed to infected residual trees and, of this, one-third had young trees that were not yet visibly infected. Where infection had occurred, only 5-20% of the young trees was diseased. Almost half of the area of young trees infected by dwarf mistletoe was associated with single or scattered residual infected trees. These results substantiated the importance of eradicating single or scattered infected trees from cutblocks. They also suggested that relatively little spread of, and future impact by, dwarf mistletoe are likely to occur along undisturbed margins of relatively large cutblocks. More detailed surveys are needed to determine rates of spread into young stands adjacent to various types of residual stands in western Canada. It would be valuable to re-survey area to determine changes in incidence of dwarf mistletoe since the 1968 survey.

ACKNOWLEDGEMENTS: The survey was done while the author was employed as a research officer with the Canadian Forest Service, Northern Forestry Centre, Edmonton, AB. Technical assistance was provided by A.A.J. Smith, deceased but still appreciated.

REFERENCES:

1. Brandt, J.P., R.D. Brett, K.R. Knowles and A. Sproule. 1998. Distribution of severe dwarf mistletoe damage in west-central Canada. Special Report 13. Edmonton, AB: Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre. 27 p
2. Province of British Columbia. 1995. Dwarf mistletoe management guidebook. Forest Practices Code of British Columbia. Min. Forests and BC Environment, Victoria. 20p.
3. Hawksworth, F.G. 1958. Rate of spread and intensification of dwarfmistletoe in young lodgepole pine stands. J. For. 56: 404-407.
4. Hawksworth, F.G. and D.P. Graham. 1963. Spread and intensification of dwarfmistletoe in lodgepole pine reproduction. J. For. 61: 587-591.
5. Hawksworth, F.G., and D.W. Johnson. 1989. Biology and management of dwarf mistletoe in lodgepole pine in the Rocky Mountains. General Technical Report RM-169. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 38 p.

6. Muir, JA. 1970. Dwarf mistletoe spread in young lodgepole pine stands in relation to density of infection sources. Canada Dept. Fisheries and Forestry, Forestry Service Bi-Monthly Res. Note 26: 49.
7. Thomson, A.J., J.A. Muir and K.J. Lewis. 1997. Variability in sub-regional impacts of dwarf mistletoe on mature lodgepole pine. For. Chron. 73: 371-375.

CROP: Lodgepole pine
LOCATION: Lakes Timber Supply Area (TSA), Prince Rupert Region, Central Interior British Columbia

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TITLE: **ASSESSMENT OF STEM RUSTS ON LODGEPOLE PINE IN THE LAKES TIMBER SUPPLY AREA**

INTRODUCTION: Lodgepole pine (*Pinus contorta* Dougl. ex Loud.) one of the most economically important tree species in British Columbia grows over a wide range of ecosystems and produces high quality wood in relatively short rotations. However, lodgepole pine is susceptible to a wide array of stem rusts such as comandra blister rust (*Cronartium comandrae* Peck), stalactiform blister rust (*C. coleosporioides* Arth.) and western gall rust (*Endocronartium harknessii* (J.P. Moore) Y. Hiratsuka). These stem rusts are widespread throughout most forested ecosystems in British Columbia, occurring on pines and herbaceous hosts, and cause significant losses in young lodgepole pine stands (1) including reduced tree growth, lower wood quality and increased tree mortality.

METHODS: The objective of this project was to estimate the incidence of stem rusts in the Lakes TSA and map the infestation levels. These data were needed to produce a risk/hazard map to be used as a tool when planning blocks, treatments and silviculture regimes necessary to grow healthy free-growing stands. Stands in the Lakes TSA were sampled that met the following criteria: age 10 - 25 years; > 60% lodgepole pine species composition; and <7000 stems/ha. From 1995 to 2001, 331 blocks were sampled (total of 15 039ha), with an additional 2100ha re-sampled to establish any trends within the same stands over a period of years. In each stand, 100m long and 3m wide transect lines were established, up to a survey intensity of 0.5% of gross opening area. Stands were grouped into three rust incidence classes: low (<10%), moderate (10 - 20%), and high (>20%). A tree was considered lethally infected if it had any stem infection, if it had a comandra or stalactiform branch infection within 20 cm of the stem, or western gall rust on a branch within 5 cm of the stem.

RESULTS AND COMMENTS: Hard stem rusts were present in 99.7% of the sampled stands in the Lakes TSA. Percentages of the young pine stands found in each incidence class were: low 25.3%; moderate 36.4%; and high 38.3%. For details of the survey results readers should examine the map, Figure 1 and spreadsheets on the BC Ministry of Forests web page [http://www.for.gov.bc.ca/hfp/forsite/rusts/rusts_surveys.htm]. These results were similar to incidence of stem rusts previously determined from a random selection of young pine stands in the TSA (1). High incidences of stem rusts were frequently found adjacent to long straight openings (right of ways) such as electricity transmission lines, gas pipelines, highways and railway lines, where winds or breezes were frequent or persistent. High incidence areas were most often clustered and thus likely indicated high risk and hazard zones across the landscape. Ecosystem classification was not correlated with rust incidence.

Based on an examination of tree growth segments, we noted that many of the stem infections corresponded to the year 1992. According to weather stations in the area, May of 1992 was cool with an average of 43% relative humidity and windy. June of 1992 had above-average temperatures, an average 45% relative humidity and was windy. Hard stem rusts are a natural component in lodgepole pine forests in the Lakes TSA that have significant impacts on timber yield (1) and thus must be considered when establishing and managing our plantations.

REFERENCE:

1. Woods, A.J., A. Nussbaum and B. Golding. 2000. Predicted impacts of hard pine stem rusts on lodgepole pine dominated stands in central British Columbia. Can. J. For. Res. 30: 476-481.

CROP / CULTURE: Willow species
LOCATION / REGION: Québec

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TITLE/TITRE: BIODIVERSITY OF PATHOGENIC MYCOBIOTA IN SALIX BIOENERGY PLANTATIONS, QUÉBEC

INTRODUCTION AND METHODS: Willows (*Salix* spp.) are of increasing economic importance for woody biomass production in eastern Canada. These fast growing deciduous trees are particularly suited to intensive culture due to their easy vegetative propagation, early growth and vigorous re-sprouting. Basket willow (*Salix viminalis* L.) is the most popular willow planted under short-rotation intensive culture (SRIC) in Quebec in densely spaced, irrigated and fertilized orchards that are mechanically harvested annually or biannually. However this system is ideai for the development and spread of diseases. We found that after about five growing seasons, willow diseases became very frequent. This preliminary study was completed to determine fungal microorganisms associated with different disease symptoms on basket willow in SRIC, under various drainage conditions and fertilization treatments. In autumn 1999, samples were collected from 20 trees in each of 4 experimental sites from: a) 30 green and 30 necrotic leaves, b) 10 green and 10 necrotic stems of 1m length, and c) 3 green and 3 necrotic collars with parts of roots. Isolation and identification of microorganisms were completed in laboratories of the IRBV.

RESULTS AND COMMENTS: Results are presented in Table 1. All 34 fungal taxa have never been reported on *Salix viminalis* in Quebec and Canada. Among those, more than 60% have never been mentioned on *Salix* hosts in North America. Unfortunately, we do not know more about their origins. Also, it is possible that some of them could be new fungal species. Basket willow is native to Europe and Asia, and it is possible that some exotic fungal species were introduced accidentally on willow cuttings planted in Quebec. Future studies on the pathogens are needed in order to identify the origins of most aggressive fungi attacking willow. The aim of these studies is to develop an adequate control strategy to increase willow biomass production and quality in SCIR plantations.

REFERENCES:
1. Farr, D.F., Bills, G.F., Chamuris, G.O., and Rossman, A.Y. 1989. Fungi on plants and plant products in the United States. APS Press, St Paul, USA.
2. Ginns, J.H. 1986. Compendium of plant disease and decay fungi in Canada (1960-1980). Research Branch, Agriculture Canada, 416 pp.
3. Société de protection des plantes du Québec (SPPQ). 1996. Noms des maladies des plantes au Canada. MAPAQ, Direction de la recherche et du développement, Québec, Canada.

Table 1. Microfungi (pathogenic and non-pathogenic) found on basket willow (*Salix viminalis* L.) in intensively managed plantations in southern Quebec.

FUNGAL SPECIES ON BASKET WILLOW	INFECTED PART OF PLANT**	OTHER KNOWN *Salix* HOSTS IN NORTH AMERICA
Alternaria sp.	L	USA[1]
Apostemidium quernisacii (Crouan) Boud.	S	NONE
Botryosphaeria sp.	S	USA
coelomycetous species*	R	NONE
Coniothyrium sp.	S, R	USA
Cucurbitaria sp. (an. *Diplodia* sp.)	S	NONE
Cryptodiaporthe salicina (Curr.) Wehm.	S	CA[2]
Cryptodiaporthe salicella (Fr.:Fr.) Petr.	S	CA[2], QC[3], USA
Cryptomyces maximus (Fr.) Rehm.	S	CA, QC, USA
Cytospora sp.	S	CA, QC, USA
Discosia sp.	L	NONE
Discosporina sp.	L, S	NONE
Glomerella cingulata (Stoneman) Spauld. & Schrenk	L, S	CA, QC, USA
Kerssleriella sp.(an.*Dendrophoma* sp.)	S	NONE
Leucostoma sp.	S	CA, QC, USA
Leptosphaeria sp.	L	QC
Lophiostoma sp	S	NONE[1,2,3]
Marssonina sp.	L	CA, QC, USA
Massarina sp.	S	NONE
Melampsora spp.	L	QC
Monostichella salicis (Westend.) Arx	L	CA, QC, USA
Ophiobolus sp.	S	NONE
Pezicula ocellata (Pers.:Fr.) Seaver	S	CA, QC
Phyllosticta apicalis J.J. Davis	L	CA, QC, USA
Phoma sp.	S	QC
Phomatospora sp.	S	CA, QC
Phomopsis sp.	S	QC
Sphaeropsis sp.	S	QC, USA
Truncatella angustata (Pers.) Hughes	L	NONE
Uncinula adunca (Wallr.:Fr.) Lév.	L	CA, QC, USA
Valsa sordida Nitschke	S	CA, QC, USA
Valsa sp.	S	CA, QC, USA
Venturia sp. (anamorph: *Fusicladium*)	L, S	QC
Venturia saliciperda Nüesch	L, S	CA, QC, USA

* Taxon was not determined to genus.
** Infected parts: S -Stem; L - Leaves; R - Root;
Salix host in : CA -Canada, QC - Québec province, USA - United States of America;
Unknown other *Salix* host in North America : NONE;
[1, 2, 3] - See corresponding citation number in list of references.

CROP / CULTURE: Yew species
LOCATION / EMPLACEMENT: Québec

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TITLE/TITRE: CRYPTOCLINE ANTHRACNOSE OF PACIFIC YEW IN CANADA

INTRODUCTION AND METHODS: Vujanovic and St-Arnaud (2) recently described *Cryptocline taxicola* (Allesch.) Petrak (Coelomycetes) on Pacific yew (*Taxus brevifolia* Nuttall) in Quebec province, Canada. This was the first report of the fungus infecting living needles. *Cryptocline taxicola* is known to occur on needles of *T. baccata* var. *fastigiata* in Europe and *T. baccata* var. *canadensis* in Vermont, USA (1). During August 1999, 2000, and 2001 in tree plantations at the Montreal Botanical Garden: 10 non-symptomatic, 10 chlorotic and 10 necrotic, current (30) and second-year (30), needles of Pacific yew were collected from each of 10 trees to determine the frequency of fungal colonization. This investigation was completed in laboratories of the IRBV.

RESULTS AND COMMENTS: An average of 85% of symptomatic and 32% non-symptomatic needles were infected by *C. taxicola*. Out of a total of 10 surveyed trees at each of the two sites (Alpine Garden and Chinese Garden), the number of diseased trees increased from 28% (3 trees per site) in 1999 to 55% (6 trees per site) in 2001 (Fig. 1). Characteristic disease symptoms on current and second-year needles of Pacific yew are shown in Figure 2 to assist disease diagnosis and to warn of the potential disease problems in yew ecosystems in eastern Canada. Unfortunately, the range of hosts, distribution, ecology and impact of the disease on forest ecosystems and tree plantations in Canada are still unknown.

REFERENCES:

1. Morgan-Jones G. 1973. Genera Coelomycetarum. VII. Cryptocline Petrak Can. J. Bot. 51: 309-325.
2. Vujanovic, V., St-Arnaud, M. 2001. First report of Cryptocline taxicola infecting Pacific yew (Taxus brevifolia) in eastern North America. Plant Dis. 85: 922.

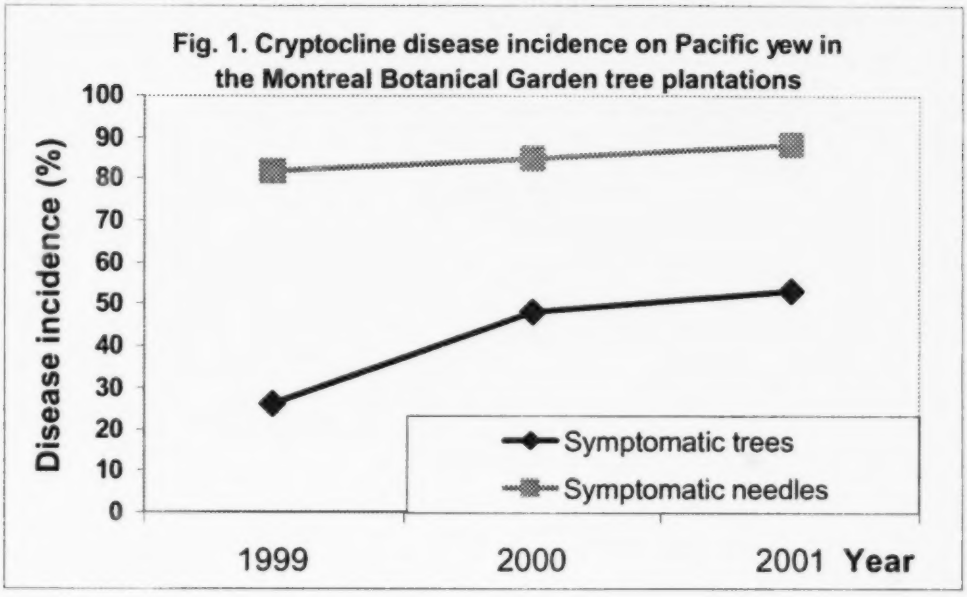
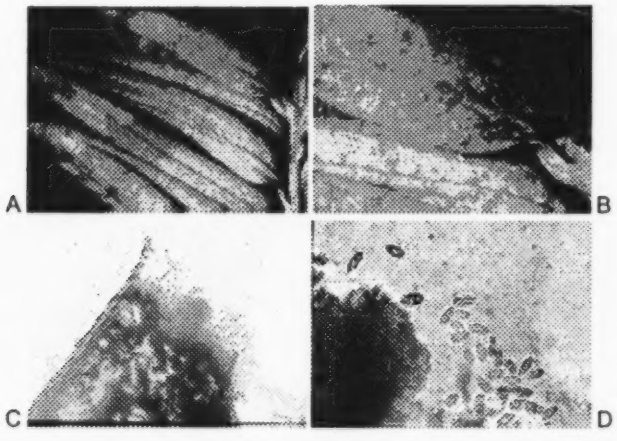


Figure 2. Cryptocline taxicola (Allesch.) Petrak (Coelomycetes) on needles of Taxus brevifolia Nuttall : A. Symptomatic, chlorotic and necrotic needles; B. Acervuli on needles; C. Acervulus transverse section; D. Conidia.



CROP: Whitebark pine
LOCATION: British Columbia

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TITLE: WHITEBARK PINE AND WHITE PINE BLISTER RUST IN BRITISH COLUMBIA - 2000

INTRODUCTION: Whitebark pine (Pinus albicaulis Englem.) is found in subalpine forests throughout the province south of 56° N latitude. The future survival of whitebark pine is threatened by white pine blister rust (WPBR), an exotic disease caused by the fungus Cronartium ribicola (J. C. Fisch.). This was the final year of a province-wide survey of whitebark pine first reported in CPDS two years ago.

METHODS: High-elevation stands from the Coast to the Rocky Mountains having a leading or significant component of whitebark pine were identified using the provincial forest inventory. Once a stand was located, the surveyor visually inspected the first 50 live and dead whitebark pine trees encountered for WPBR during a strip transect reconnaissance.

RESULTS: Of 13,577 whitebark pine trees examined in 2000, 2522 (18.6%) were dead (Table 1). Mortality on 1490 (59.1%) of these dead trees could be directly attributed to WPBR. Due to the difficulty of diagnosing some dead trees, this figure is conservative as dead trees without obvious stem cankers were classified as dead due to other factors. These other factors include mountain pine beetle (Dendroctonus ponderosae Hopk.), abiotic factors, and unknown or unidentified causes.

Of the remaining 11,055 live trees, 5989 (54.2%) are infected with blister rust. In addition, many trees suffered defects such as basal sweep, lean, dead or broken tops, forks, crooks, and damage from feeding by squirrels and other mammals. Overall, infection appeared to increase from west to east across the province. Long-term monitoring will indicate if mortality levels are increasing over time.

I gratefully acknowledge the assistance of several individuals in conducting the field portion of this project.

Table 1. Summary of whitebark pine survey results for 2000 in British Columbia.

Forest District or Provincial Park (PP)	No. of trees	Tree Status							
		Live, Uninfected		Live, Infected by WPBR		Dead, from WPBR		Dead, Other or Unknown	
		#	%	#	%	#	%	#	%
Arrow	800	347	43.4	295	36.9	110	13.8	48	6
Boundary	900	398	44.2	310	3	107	11.9	85	9.4
Cranbrook	4250	1430	33.7	1825	42.9	601	14.1	394	9.3
Chilcotin	1549	1119	72.2	340	22	54	3.5	36	2.3
Clearwater	78	18	23.1	36	46.2	17	21.8	7	9
Columbia	900	293	32.6	312	34.7	117	13	178	19.8
Invermere	1650	753	45.6	634	38.4	172	10.4	91	55
Fort St. James	350	148	423	145	414	13	37	44	12.6
Kokanee Glacier PP	250	93	37.2	87	34.8	58	23.2	12	4.8
Kootenay Lake	650	315	48.5	219	33.7	80	12.3	36	5.5
Lillooet	750	418	55.7	259	34.5	43	5.7	30	4
100 Mile House	200	100	50	53	26.5	14	7	33	16.5
Mount Robson PP	150	63	42	66	44	15	10	6	4
Penticton	750	374	49.9	301	40.1	46	6.1	29	3.9
Robson Valley	350	120	34.3	184	52.6	43	12.3	3	0.9
Total	**13577**	**5989**	**44.1**	**5066**	**37.3**	**1490**	**11.0**	**1032**	**7.6**

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